November 1960

Insulation

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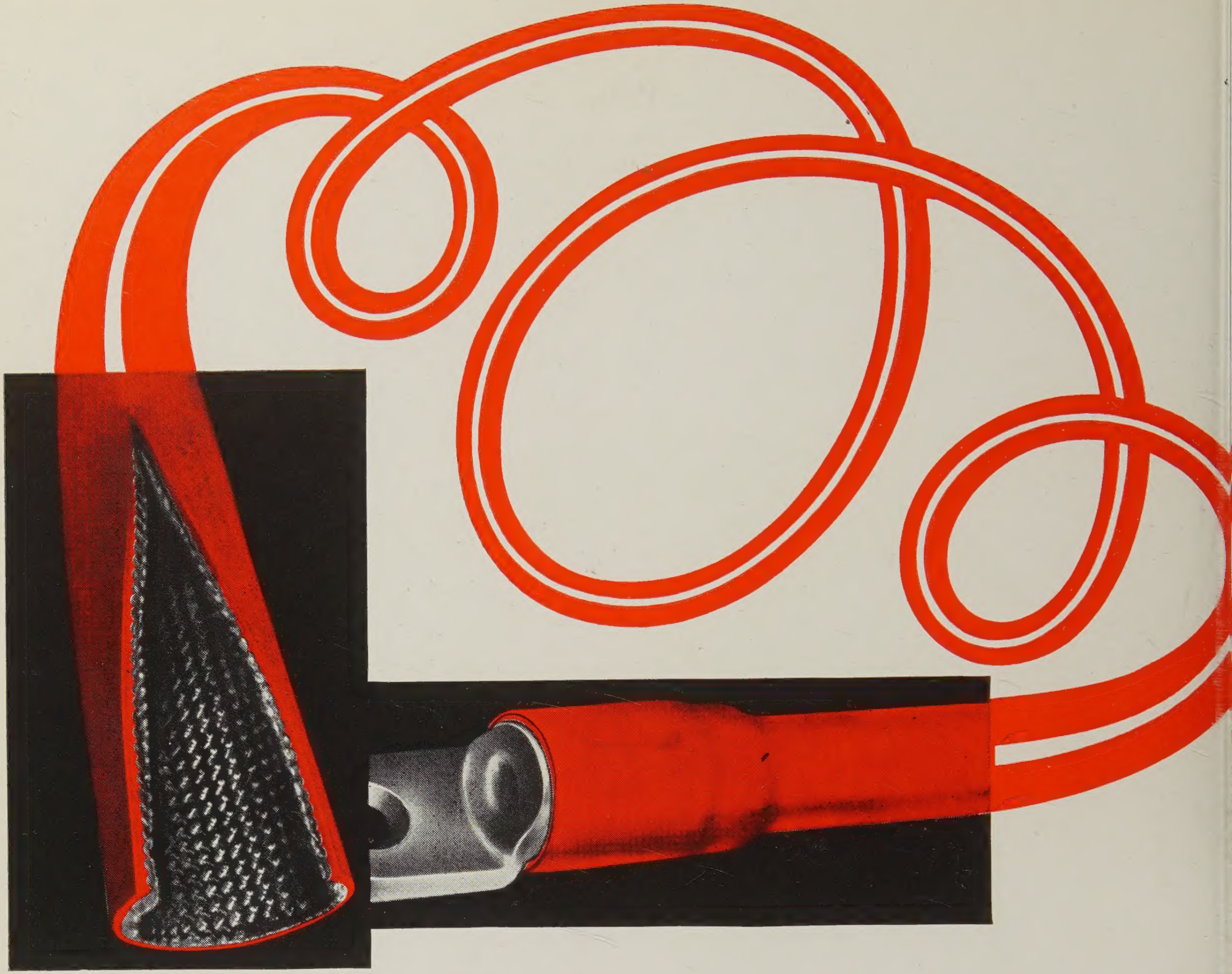

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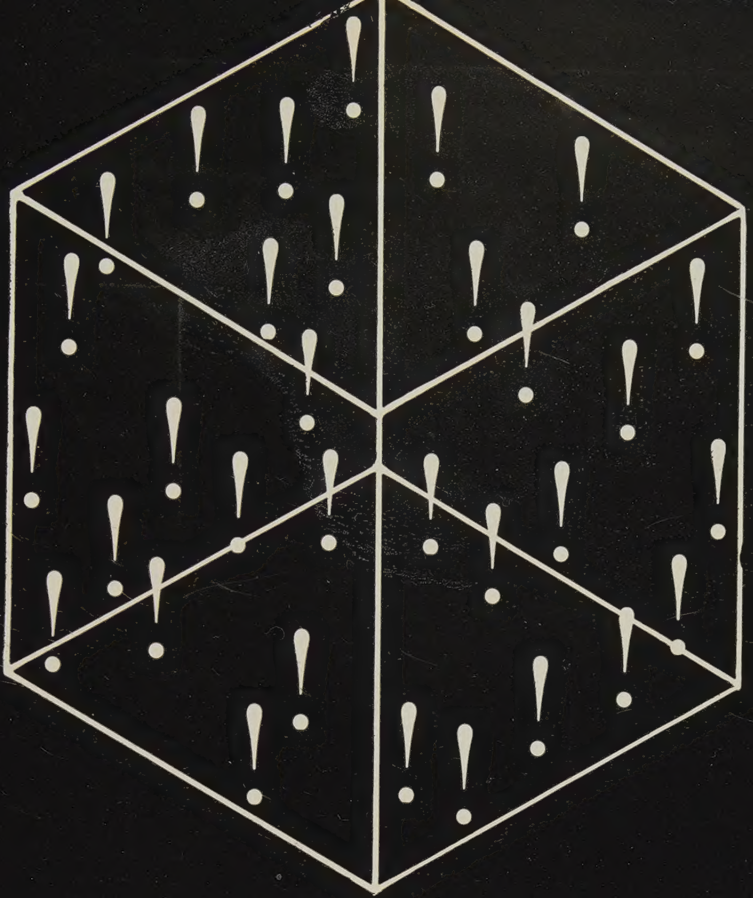

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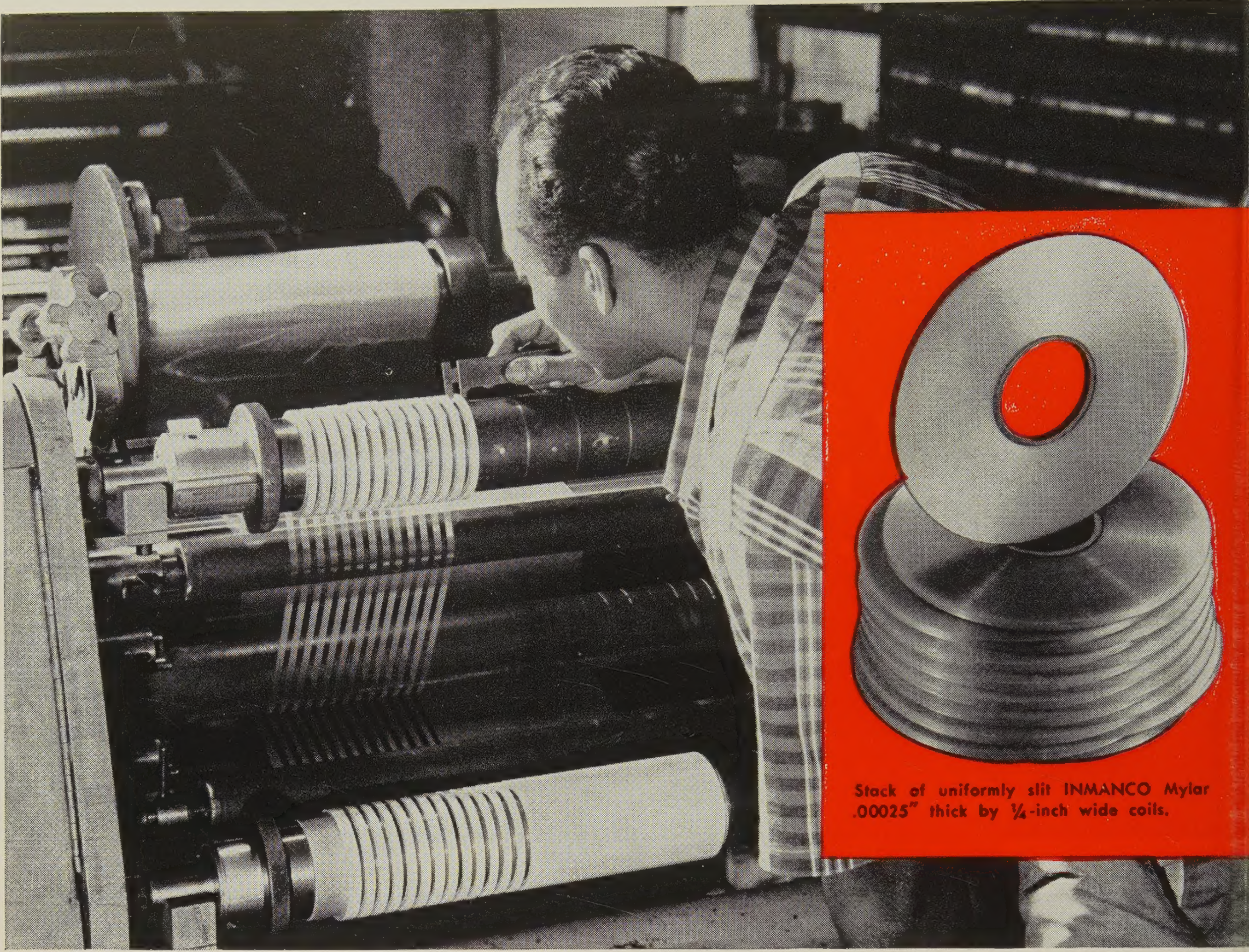

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Insulation

For the Electrical and Electronic Industries

Lake Publishing Corporation, 311 East Park Avenue, Libertyville, Illinois, November 1960

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Associate Editor: Richard D. Simonson
Assistant Editor and Production Manager: F. P. Mignin
Contributing Editors: Graham Lee Moses, H. K. Graves, Mike Rivise
Art Director: Randall R. Roth

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Advertising Sales Offices: See page 92.

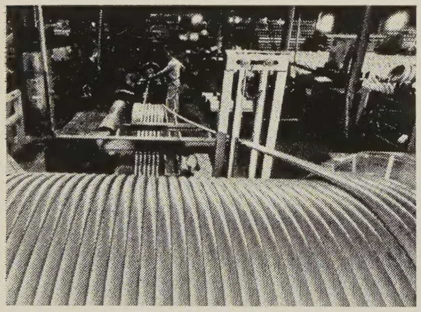
From the Editor

Opinions and Rambling Thoughts

Hodgepodge

Every so often we report or comment on the more fascinating of the month's collection of news releases so that our readers will be able to drop bits of ego-inflating knowledge at cocktail parties, neighborhood barbecues, and communist party cell meetings. These items of information may be in or out of the insulation field, and serious or tongue in cheek. However, they all are guaranteed to impress your listeners provided your tone of voice and facial expression are proper. But don't make the mistake of attending gatherings where other *Insulation* readers may be present. And did you know that "hodgepodge" is from "hotchpotch" which is a stew of various ingredients?

The first item for your enlightenment was selected mainly on the basis of the superb photograph which we couldn't resist. It shows aluminum transmission conductor for Pennsylvania Electric Company's 460,000 volt prototype line. The new 13-mile line is achieving the highest voltages of any line serving an established transmission grid in America. Other "firsts" for the project are: the use of the largest aluminum transmission conductor (2.32″ in diameter), and the use of a new conductor which has hollow tubes in its core to increase the diameter.



Remember how the laundromats sprung up throughout the country in just a matter of a few years. Well, now you're likely to see coin-operated dry cleaner establishments make similar progress. Whirlpool Corp. is now field testing the units—they are self-contained and operate on 220-volt current. The complete dry cleaning cycle takes about 50 minutes for a load of eight pounds.

From DuPont comes word that dental hygiene can now be fun for youngsters and oldsters alike. "Ice Cream Brushes" introduced by Tek-Hughes are offered in chocolate, vanilla, orange, lemon, lime, and strawberry—colored and scented to give the impressions of these flavors. The odors are impregnated in the plastic handles.

DuPont has also announced that their engineers, temporarily diverted from more important tasks, have solved the problem of nylon shoelaces which don't stay tied. It's all done by exposing the nylon yarn to a jet of air under high pressure which adds bulk and alters the texture, removing the slipperiness.

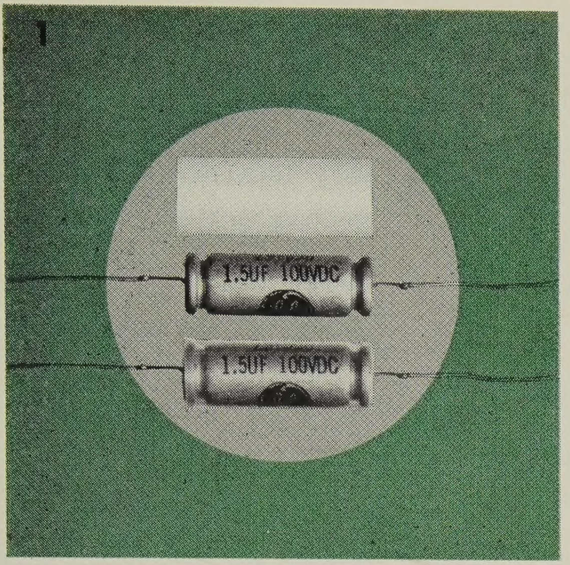
According to Dr. Edwin G. Schneider of Sylvania Electric Products Inc., intelligible phone conversations from continent to continent with different languages being spoken on either end of the line will be possible within the next 20 years. Schneider says that the basic computer mechanism for automatic translation is already in existence, although primitive—to complete the translation for spoken words, it will be necessary to automatically recognize the basic sounds of speech, independent of the peculiarities of the speaker, and to reconstitute these sounds from information stored in the computer memory. He goes on to point out tha fairly reliable recognition of vowel clearly spoken by a male voice ha been accomplished—but that the sam equipment was unable to understan women . . . if men can't understan them, how can a machine?

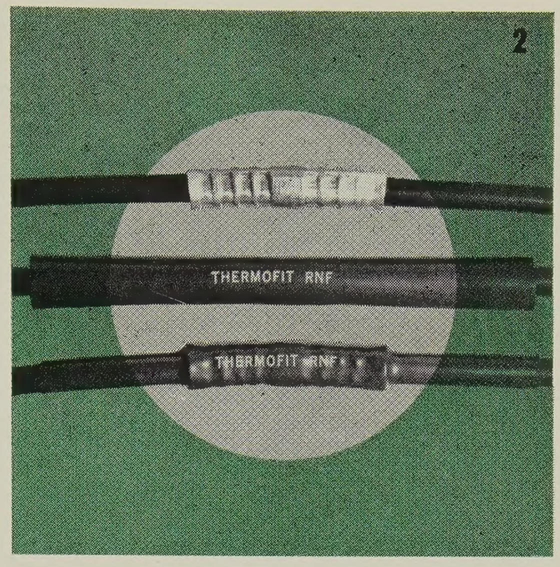
Schneider's boss, Don G. Mitchel president of General Telephone Electronics Corp. (parent compan of Sylvania), also came up with som interesting observations recently. Ci ing the electronic computer as "instru mentation's greatest promise for th solution of complex industrial prob lems," Mitchell said that the com puter's many potential benefits can not be fully realized unless great emphasis is placed on getting th right information to the right plac at the right time.

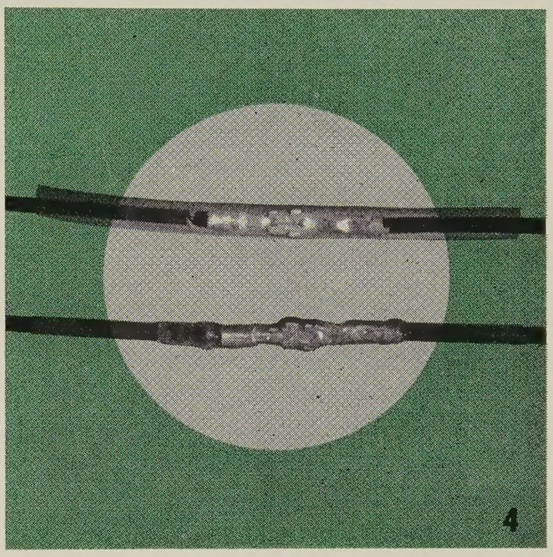
And down in the Caverns of Luray Va., you see Leland W. Sprinkle, Sr playing the organ he invented to d rive musical tones directly fro Cavern's stalactites. Small threade rods of Allegheny Ludlum Ste Corporation's alloy steel are bolte through the stalactites, close to tin wire-wound magnets. When an ele tronically controlled hammer strik a stalactite, the combination becom a tone generator.

It's true that you can't buy happine with money, but you can't buy gr ceries with happiness, either.

—*Wooden Barr*







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News and Views

Experimental Ethylene-Propylene Rubber for Wire Coating

A new rubber for possible use as a wire coating has been revealed by Hercules Powder Co. Reports state that the new EPR (ethylene-propylene rubber) appears to meet or exceed many of the important properties of SBR, natural rubber, butyl, and other commercial elastomers. The material, still in the laboratory stage, is listed as possessing outstanding ozone and weathering resistance.

Questionnaires in Mail for Insulation Directory/Encyclopedia

Within the next couple of weeks, all known producers, fabricators, and distributors of insulation products, wire, cable, test instruments, and processing equipment should receive copies of the listing questionnaire for the first annual *Insulation Directory/Encyclopedia.* If your company should receive a questionnaire, but does not, please contact Lake Publishing Corporation, Box 270, Libertyville, Ill. Firms will not be listed unless the questionnaires are returned.

Target date for the first annual issue of the new publication is May 1961. It will be distributed to all *Insulation* subscribers. In addition to the directory listings, it will serve as an encyclopedia or user manual for everyone concerned with insulation. Materials, properties, sizes, forms, specifications, applications, etc., will be described and evaluated.

The *Insulation Directory/Encyclopedia* will include the following sections: Flexible Tubings, Sleevings, and Tubular Specialties; Gaseous Dielectrics; Liquid Dielectrics; Reinforced and Laminated Plastic Sheets, Tubes, and Rods, Copper Clad and Unclad, Plain and Composite; Printed and Molded Circuits; Treated and Untreated Vulcanized Fibre and Fishpaper; Non-Supported Flexible Plastic and Rubber or Elastomer Films, Tapes, or Sheetings (Not Self-Adhering); Mica Products; Magnet Wire; Insulated Wire and Cable and Assemblies (Except Magnet Wire); Treated and Untreated Papers and Boards; Flexible Cloth, Film, Fiber, Mat, and Paper Composite Insulations; Plastic Resins, Molding and Extruding Compounds, Parts, Plasticizers, Fillers, Reinforcements, Additives, Etc.; Ceramics and Glasses; Rubbers and Elastomers; Fiber Tapes, Non-Adhesive; Flexible Coated or Treated Cloth, Mat, and Unidirectional Yarn Tapes and Sheeting (Not Self-Adhering); Pressure-Sensitive, Adhesive, and Self-Adhering Tapes and Specialties; Fibers, Cords, and Twines; Solidifying Fluids and Powders for Coating, Impregnating, Embedding, Encapsulating, Potting, and Casting; Insulation Test Instruments, Equipment, and Methods; Production and Processing Equipmen for the Use of Insulation; and Insulation Standards, Con cepts, and Applications. There also will be a glossary c insulation terms.

Advertising rates for the new publication will be ident cal to those for *Insulation* but insertions in the annual wi not count toward earning a better rate in *Insulatio* Because of the year-long life of the annual and its referenc value, catalog type multiple page advertisements on th advertiser's complete line of products are strongly recom mended. Advertisers may select the section in which the wish their advertising to appear.

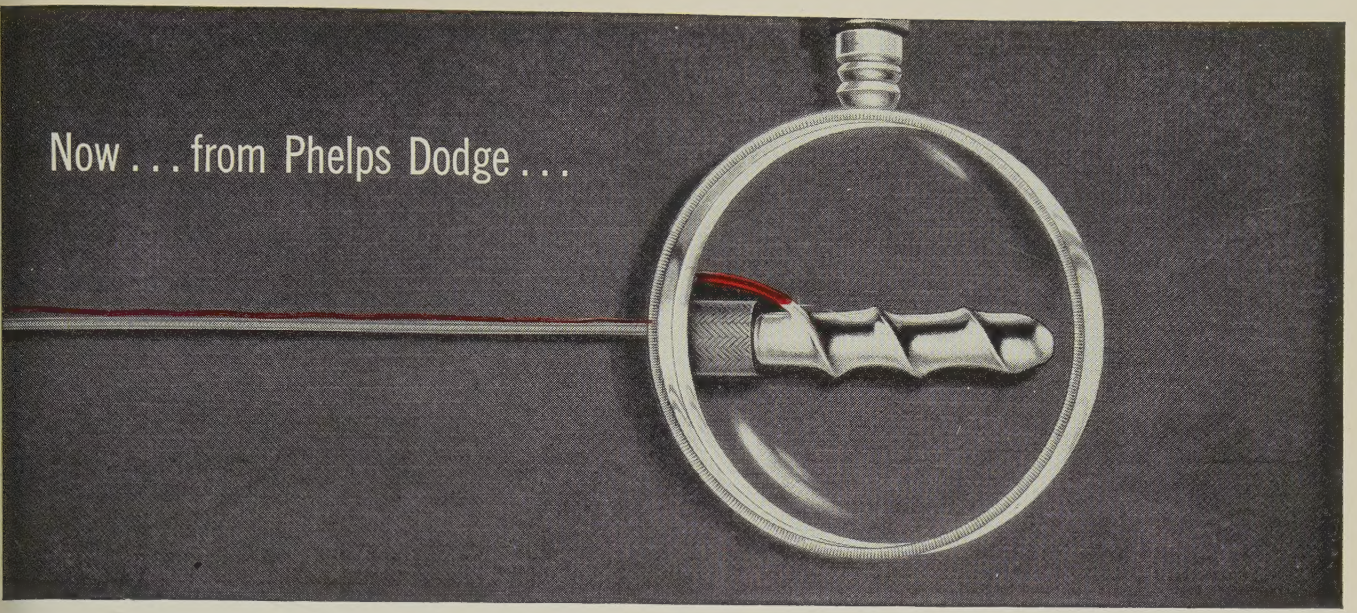
Lake to Publish New Monthly Plastics Magazine

A new monthly publication, *Plastics Design & Proces ing,* with an estimated circulation of 20,000 has bee announced by Lake Publishing Corporation, publisher c *Insulation.* The new magazine will appear in the sprin of 1961. It will be editorially directed to the plastic molders, extruders, laminators, formulators, fabricator etc.—companies which process and use plastics. Accord ing to the publisher, Lincoln R. Samelson, this is an area c specialization within the plastics field which is not ad quately covered at the present time by existing broa publications.

George V. Michael has been named editor of *Plastic Design & Processing.* A graduate chemical engineer, h most recently has been associated with Putman Publishin Co., Chicago, as editor of "What's New in Plant Enginee ing Equipment," editor of "Plant and Power Service Engineer," and assistant editor of "Chemical Processing.

An unusual feature of the new publication is that sub scriptions for manufacturers of raw materials, processin machinery, and tools or molds for plastics will not b counted as qualified circulation. The publisher claims tha such subscriptions represent waste circulation for mo advertisers although other plastics magazines classify the subscriptions as qualified circulation. The circulation c *Plastics Design & Processing* will be carefully controlle to reach the engineers, production supervisors, designer purchasing agents, and management men responsible f the processing, buying, and specifying of plastics. It planned to have the circulation audited as soon as th necessary time requirement has been met.

Twelve-time black and white page rate for *Plasti Design & Processing* advertising will be $518. The mag zine will be standard size, 8¼ by 11¼. The distinctiv design of the new publication is under the direction of a designer Randall R. Roth, nationally known for his awar winning work.



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Insulation Forum

This regular monthly feature is built around a timely question concerning the electrical insulation field. Your suggestions for future questions and participation are invited. This month's question is:

What good things about last year's insulation conference would you like to see repeated and what improvements would you like to see made in the Third National Conference on the Application of Electrical Insulation?

P. A. Rickard

Transformer Design Engineer, Moloney Electric Co. of Canada Ltd., Toronto, Canada.

"Prominent among the good features of last year's insulation conference was the firmly maintained schedule of interesting papers. The ample opportunity for the informal sharing of technical knowledge and experience was valuable. The fine displays of materials were complemented by the well informed response to inquiries.

"Future conferences will be even more valuable if attention to the remarks of G. A. Monito at last year's conference leads to a greater emphasis upon complete, comparative data which will enable the designer, who is responsible for the safety and quality of whatever he designs, to make selections from newer materials with confidence. A balance of emphasis in terms of research, supply, and design is desirable."

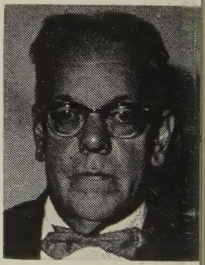
Eugene E. Hand

Associate Director, Applied Physics Div., High Voltage Engineering Corp., Burlington, Mass.

"One commendable feature of las year's conference was its comfortabl size. Most of the papers and exhibit were of interest and of good quality There seems to exist here an opportunity of controlling growth by keep ing the standards high in the technical sessions, by encouraging exhibitors to consider the users' viewpoin and interests, and by insisting o complete and accurate materials evaluations using up-to-date standar and methods.

"Quantity at a conference is neve impressive if the quality deteriorate As a matter of fact, Admiral Rickover's comments last year about goo technical standards, codes, and pra tices can also be applied to the co ference itself.

"I sensed a general enthusiasm las year for the conference; let's sustai this enthusiasm by proper control.



C. V. Irish

Assistant Chief Engineer, Electro Dy namic Div., General Dynamics Corp Bayonne, N. J.

"Last year's insulation conferenc was well planned and everything pr gressed quite smoothly. On the whol the papers were well prepared. However, too much time was spent in pr senting the papers, especially whe they were *read* in full. As everyo had the printed papers, the present tion could have been an abstract s that more time could have been give to questions and discussion.

"The field was well covered by th exhibitors, but it was more of a co mercial display than of an applic tion conference. Their salesmen kee

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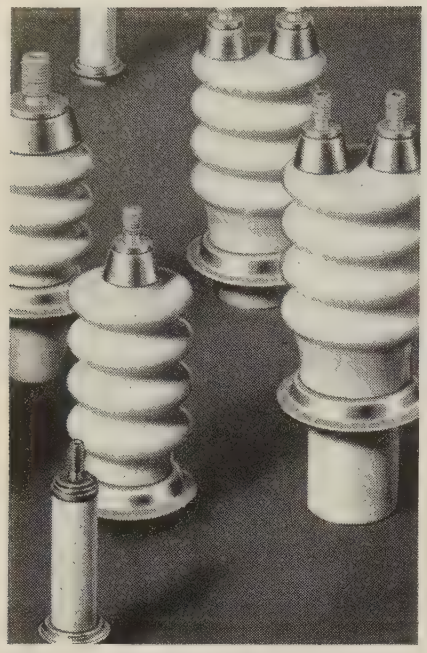

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us informed throughout the year regarding their products. At an application conference they should have their best men available to discuss application problems and not just someone to attend the booth."

Robert W. Korb

Member of the Technical Staff, Hughes Systems Development Laboratories, Hughes Aircraft Co., Culver City, Cal.

"Since the conference is intended to show the application of electrical insulation, most of the papers are about specific applications or describe new insulation materials. Because of this diversity of subject material it is difficult to have one paper or group of papers that draws a large response from the audience. In spite of this fact, last year's session on dielectric strength testing was one of the most successful for several reasons. First. the subject was basic to electrical insulation from an engineering view. Second, the papers were above average and were presented by well qualified people. And third, the question and answer discussion following the talks created much interest.

"This type of session, one that covers a basic subject or problem associated with the insulation field, provides a focal point to give the conference a special purpose and should be continued.

"An improvement in this year's conference should be in the way of putting more stress on electronic applications and the application of insulation in space environments."

R. E. Ballard

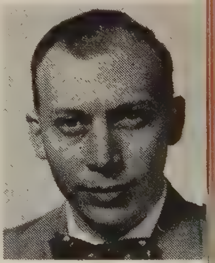
Production Engineering Dept., Telecommunication Div., Stromberg-Carlson Co., a Div. of General Dynamics Corp., Rochester, N. Y.

"I am again looking forward to attending this year's insulation conference and hope to see most of the events of the 1959 conference repeated.

"First and foremost, I would include the outstanding quality of last year's technical sessions as one of the good things to be carried over. The conference banquet is another must for 1960 and will provide a challenge to the committee to match the top level program of the previous year . "Exhibitors Night or a similar 'ge together' is another event well worth continuing, as it offers the opportunity to greet old friends and to add to one's list of acquaintances in the insulation field.

"As far as improvements, there are only a few that I can suggest. I would like to see more of the exhibits devoted to the actual application of the various insulations. Models or cut away views of electrical equipmen and components showing the utilization of different insulating systems and a statement of why they were chosen would be of particular value

"I believe also that the present arrangement of the technical sessions under common fields of interest lends itself very well to a discussion pane by the authors of similar papers, perhaps at the end of each session. I am sure that those in attendance would find it stimulating since a good many points not covered specifically in the presentations would certainly be brought up."



S. B. Heberlig

Transformer Engineer, Transformer & Rectifier Div., I-T-E Circuit Breaker Co., Philadelphia, Pa.

"As an engineer working in electrical design, I have found that selection of insulating materials can be one of the most troublesome phases of the complete design. This problem is compounded by an abundance of optimum technical data and competitive tradenames. At last year's conference I was pleased to note that there was an awareness that problems between suppliers and users actually exist. I should like to see this trend continue with some emphasis placed on identification of tradenames of similar products.

"The technical papers presented last year were fine. Especially pleas-

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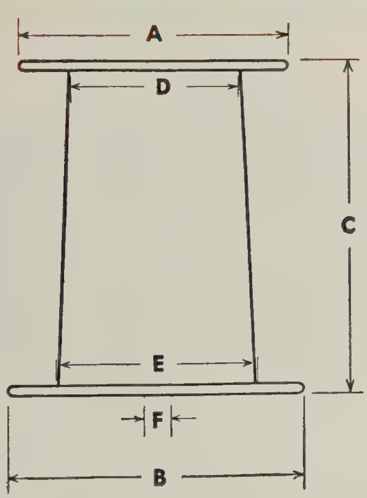
The exclusive new HUD-PAK is the most important money-saving development in wire packaging in 20 years. With many conductor and AWG sizes, users report record payoff speeds in excess of 5000 feet a minute. HUD-PAK reduces waste from short spools. Its tapered barrel spool—and absence of inertia found with rotating spools—permit instantaneous starts and stops with no danger of wire shakedown and tangle.

We are currently supplying HUD-PAKS containing bare copper wire, tin plated, silver plated, and aluminum wire. Other types are being developed. Optimum results can be obtained within the size range of AWG 38 to AWG 24.

The term "HUD-PAK" is a trade-mark of Hudson Wire Company



	A	B	C	D	E	F
HUD-PAK 120	10″	11″	13½″	6½″	7½″	1¼″
HUD-PAK 50	8½″	9½″	9⅞″	6″	7″	1¼″

CAPACITIES

MATERIAL	Approx. Weight (lbs.) 120	Approx. Weight (lbs.) 50
COPPER	120	50
CADMIUM COPPER	120	50
ALUMINUM	37	16
BRASS 70/30	115	48
PHOSPHOR BRONZE	120	50
NICKEL SILVER	115	50
STEEL	107	44

HUDSON WIRE COMPANY
OSSINING DIVISION, OSSINING, NEW YORK
TELEPHONE: WILSON 1-8500

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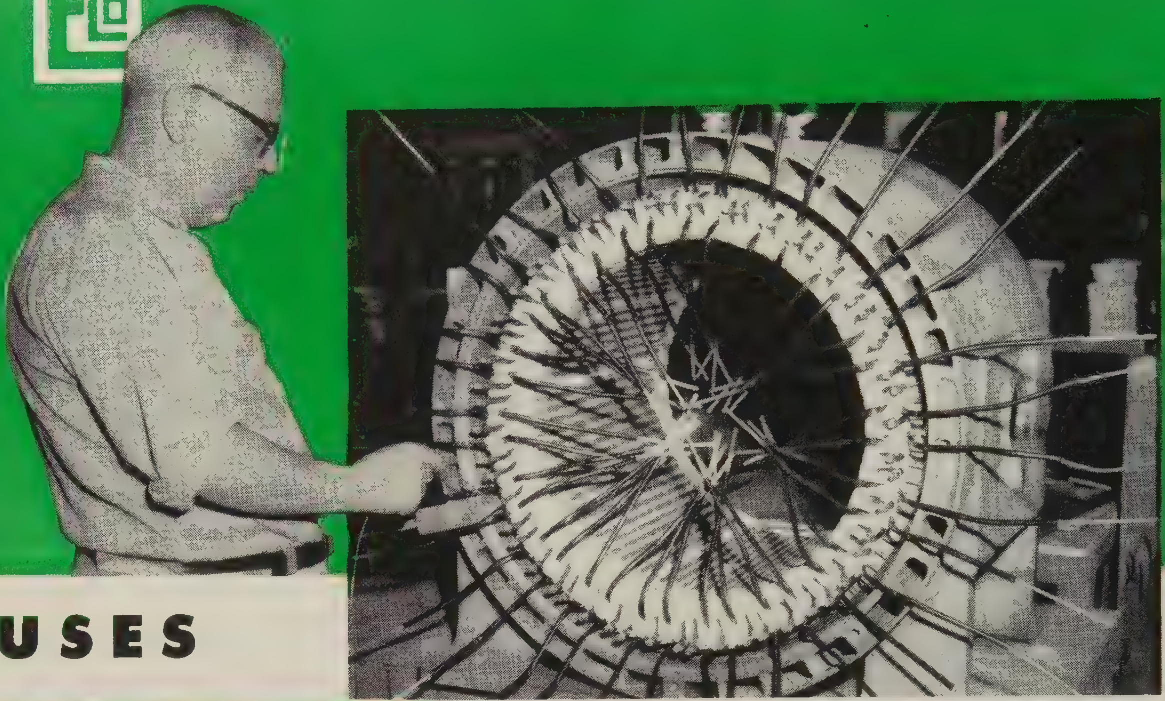
ELLIOTT CROCKER-WHEELER



USES

Isolastane is Natvar's new elastomeric isocyanate-type coating for Fiberglas braid and tape. Isolastane sleeving being installed on coil leads and connectors of a larger AC motor.*

NATVAR ISOLASTANE® SLEEVING

TO INSULATE AND PROTECT MOTOR LEADS

The Crocker-Wheeler plant of Elliott Company builds a wide range of electrical motors in sizes up to 500 hp. Natvar Isolastane sleeving is widely used on both large and small AC induction motors.

Isolastane sleeving is especially suitable for protection of motor coil leads and connectors because of its uniformly high dielectric value, mechanical strength, and resistance to all oils and solvents commonly used in insulating applications.

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Natvar

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- Varnished cambric—sheet and tape
- Varnished canvas and duck—sheet and tape
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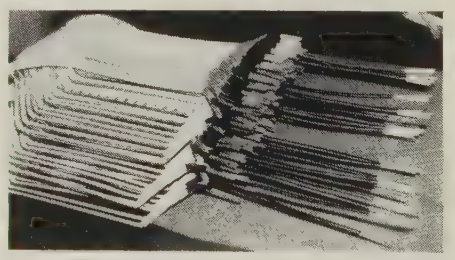
- Varnished papers—rope and kraft—sheet and tape
- Varnished, silicone varnished and silicone rubber coated Fiberglas*—sheet and tape
- Slot cell combinations, Aboglas®
- Teraglas®
- Isoglas® sheet and tape
- Isolastane® sheet, tape, tubing and sleeving
- Vinyl coated and silicone rubber coated Fiberglas tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

*TM (Reg. U.S. Pat. Off.) OCF Corp.

We will be very happy to supply information on any of our products on request.



Natvar Isolastane sleeving as applied to these AC field coil leads flexes easily and gives ample electrical and mechanical protection.

Isolastane sleeving applied to coil leads of these smaller NEMA frame motors will withstand continuous operating temperatures up to about 155°C (class F) and is extremely tough and resilient and resistant to abrasion.

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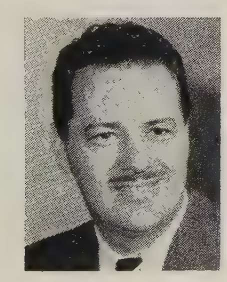
ing was the composite book of technical papers. It would be disappointing if this were not continued.

"It was very evident that the planning of last year's conference was superb. I cannot say that I found anything objectionable. The whole atmosphere was enjoyable. Certainly the banquet was unsurpassed for excellent planning and entertainment. A repetition of last year's type of conference would be more than welcome."

Warren J. Donaldson

Advance Equipment Engineering, Medium Voltage Switchgear Dept., General Electric Co., Philadelphia, Pa.

"In addition to the technical papers presented and exhibits available, an important part of any conference is the opportunity it presents to meet and talk with other people who are interested in the same subject matter. Any *scheduled* event such as a smoker, 'get-together' night, or round table discussion should be encouraged and should be considered a part of the conference. If possible, a social hour should be planned at the end of each day's sessions, since a planned meeting would encourage conferees, session directors, and speakers to congregate at one particular spot to discuss pros and cons of that day's technical sessions."

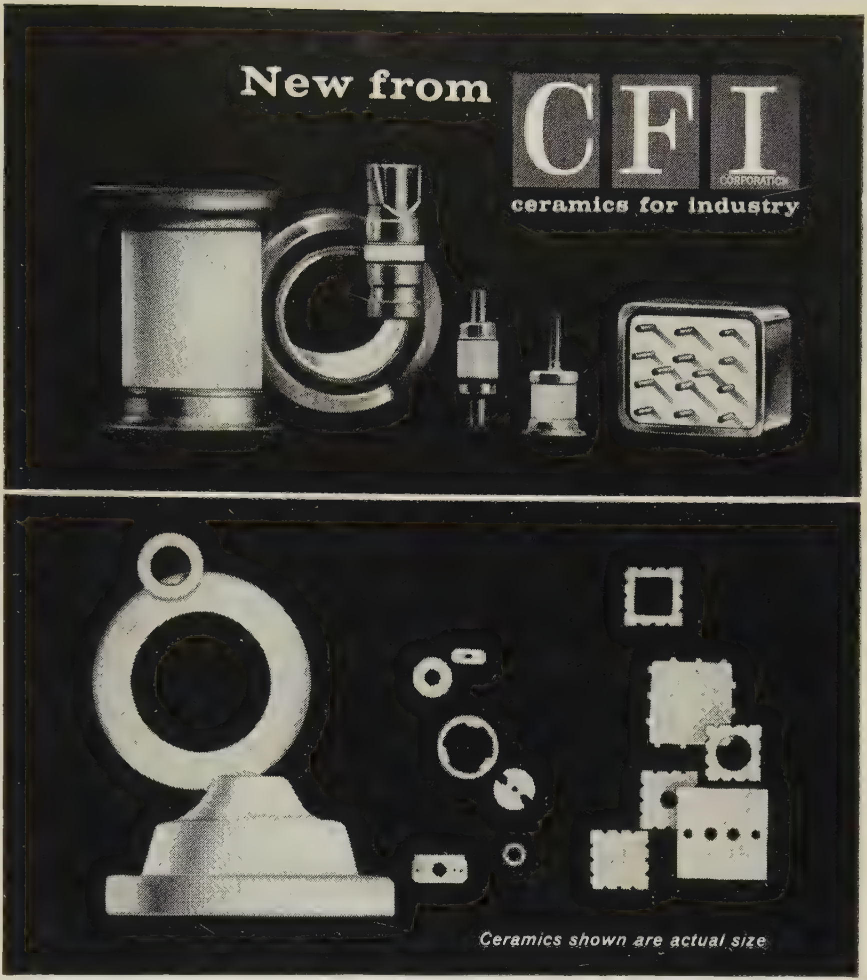


K. H. McPhee

Materials Engineer, Aircraft Radio Corp., Boonton, N. J.

"The sessions which I attended at last year's conference had a feature which should be adopted by all technical conferences.

"The authors did not read their papers, but instead gave a ten minute summary of the contents. The remainder of the time period was used for questions and answers. The audience formulated questions from the reprints which were furnished in advance, or from the verbal summary.



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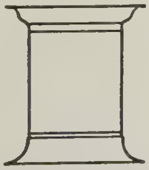

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"The age old practice of 'reading-aloud' has never been an effective method of communicating technical information. I hope you continue to avoid it in future conferences."

R. G. Black

Chemical Engineer, Cast and Molded Insulation Section, Materials Laboratories, Westinghouse Electric Corp., East Pittsburgh, Pa.

"It is very stimulating to be able to exchange ideas with the large number of well-informed technical representatives at the various exhibits. This is possible also at the technical sessions where the papers are presented, but contacts there are necessarily fewer because of the time element. I believe the interests of the Conference can best be served by retaining the present practical slant in most of the technical papers, and leaving highly theoretical papers to the AIEE, ACS, etc.

"It may not always be easy to arrange, but it would be nice to have rest rooms, drinking water, and telephones convenient to the exhibits."

D. G. McLellan

H. P. Ruggles Co. Ltd., Hamilton, Ontario, Canada.

"Considering the first Insulation Conference in Cleveland in 1958 and the broad coverage given to general insulation at that time, and the recent innovations in general insulation followed by the second conference in Washington D. C. in December of 1959, where another year's progress was tabled and produced in paper form, the writer feels that the best interests of the electrical industry would be served if these conferences were kept as an annual get-together of the industry tabling the new products and techniques produced during the current year, rather than endeav or to fancy up the conferences at all.

"The writer feels that there is very little room for improvement on either of these conferences, with the exception that the first one of necessity covered a very large scope, but which when properly covered was amply followed by the innovations of the following year's conference. The second conference left very little to be desired with the exception of acoustics in a few of the lecture centres, which could be very easily remedied.

"These conferences are the equivalent of a crystal ball for re-design to follow in the year or so after the conference. One simply has to look at the recent design changes and material changes in the switchgear motors etc., and you will find that these changes were predicted in the technical papers of the first and second conferences. Again, I would urge that we keep it plain and simple, leaving off any fancy frills, and carry on the fine job of work done by the two previous conferences."

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Hudson manufactures a full range of regular and high temperature magnet wire to meet every coil winding requirement. And with the flexibility of Hudson's relatively small production plants—and large scale stocking program—all orders receive immediate attention. For high quality magnet wire in sizes from 14 AWG to ultra-fine 0.0005" you can rely on Hudson Wire.

...for your Application

INSULATION	THERMAL CLASS (°C)	HUDSON AWG RANGE	IDENTIFICATION	PROPERTIES		TYPICAL APPLICATIONS
				PHYSICAL	CHEMICAL	
PLAIN ENAMEL	105	14-56	Natural Oleo-Resinous	Good Adherance & Flexibility	Not affected by Petroleum Or Naptha Thinners	Relays, Coils, Transformers.
EZSOL	105	22-44	Nylon Polamide-Resins	Solderable Excellent Windability	Excellent Solvent Resistance	Used in applications where prior stripping not practical.
HUDSOL	105	20-56	Polyurethane Resins	Solderable Good Windability	Excellent Moisture Resistance	Fine Wire Applications in Electronics & Communications.
FORMVAR	105	17-56	Polyvinyl Formal	Good Adherance, Toughness, Abrasion Resist.	Good Moisture & Solvent Resist.	Motors, Coils.
ISONEL "F"	155	26-56	Polyester Resins	Comparable to Formvar	Satisfactory Solvent Resist.	Class B & F Applications.
SILICLAD	155+	26-56	Silicone Resins	Good Windability Ample Flexibility	Adequate Moisture & Solvent Resist.	Military & Electronic Applications with Critical Thermal Requirements.
FABRIC INSULATION: Celanese, nylon, silk, cotton, fiber glass, served over bare wire or film insulations. AWG Range 14-44.						Magnetos, Motor Armatures, Coils.
LITZ WIRE: Available in all combinations of fabric and film-equivalent. AWG Range 12 and finer.						High Frequency Applications.

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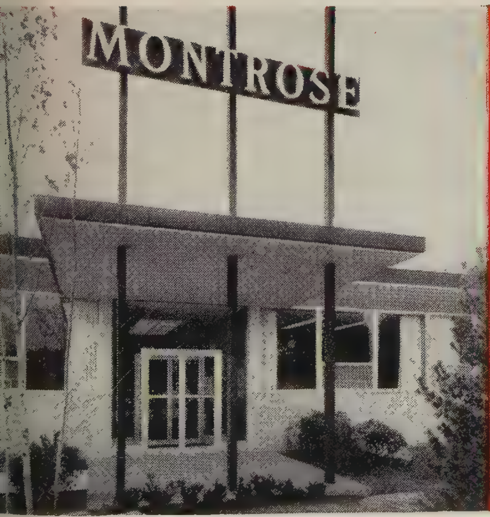
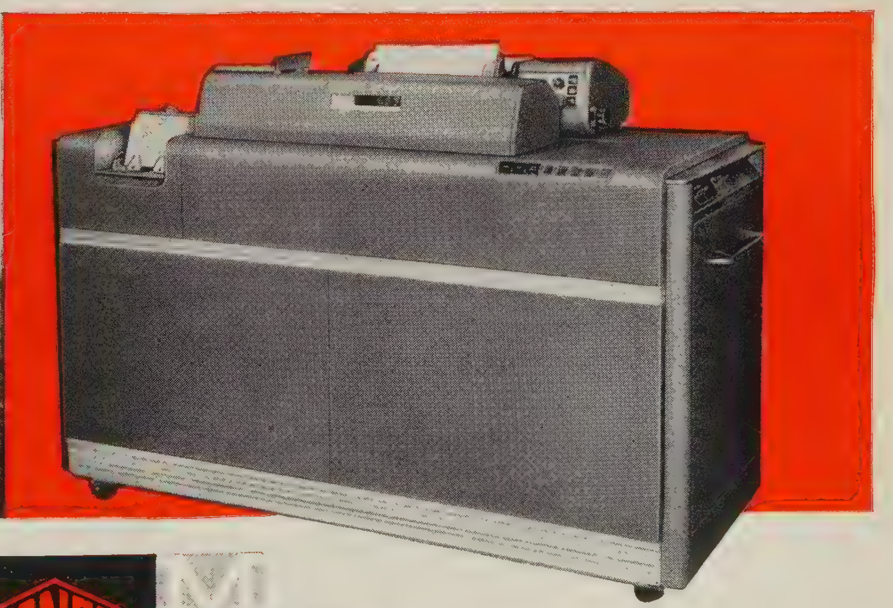
HOW TEAMWORK DEVELOPED PRECISION BUSINESS MACHINE Hook-up Wire

Montrose Products Company, Inc., Auburn, Massachusetts, knew that the electronic machine manufacturers needed a specifically designed wire for use in electronic computers, digitals and modern business machines and called upon The Blane Corporation to develop an 80° vinyl compound that would provide toughness and flexibility for this application.

• • • • The result is Blane #7198, an easy to process PVC Compound with a smooth surface appearance. It provides the insulation that gives Montrose Business Machine Hook-up Wire toughness with greater flexibility over comparable wire. Blane #7198 meets UL requirements and the very stringent deformation tests set by the Electronic Machine Manufacturers. Because of its better performance and relatively low cost, Blane #7198 becomes extremely advantageous where small wire size with good mechanical protection is a necessity.

Blane is proud of #7198, its most recent contribution to the Wire and Cable Industry, and will welcome any opportunity to work with other wire manufacturers on current or long term insulation problems.





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Program for Annual Wire & Cable Symposium

The ninth annual Wire and Cable Symposium, jointly sponsored by the U. S. Army Signal Research and Development Laboratory and industry, will be held at the Berkeley-Carteret Hotel, Asbury Park, N.J., on November 30, and December 1 and 2. As in the past, some 25 papers will be presented showing the technical progress during the preceding year in the field of communication wires and cables.

Howard F. X. Kingsley, Communications Dept., U. S. Army Signal Research and Development Laboratory, is general chairman. The co-chairman is Fred W. Wills, also of the laboratory.

The complete program follows.

Program
9th Annual Wire & Cable Symposium
November 30—December 2, 1960
Hotel Berkeley-Carteret, Asbury Park, N.J.

Tuesday—November 29

4:00 pm—Registration

Wednesday—November 30

9:30 am—Welcoming Address, Col. H. McD. Brown, Commanding Officer, U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J.

Technical Session I—S. Montgomery Jr., The Montgomery Co., chairman.

A Present and Future View of the Field Army Wire and Cable Requirements, Major D. T. Patterson, USA Signal Corps School, Fort Monmouth.

Four Wire Field Wire, L. C. Platau and R. H. Cramer, USASRDL, Fort Monmouth.

Developments in Miniature 300-600 Volt Flexible Insulated Lead Wires for Use at 700°—2000°F. W. D. Parker, Rockbestos Wire & Cable Co.

The Power Rating of "Teflon" Coaxial Cables at Extreme Environments, E. T. Pfund Jr., Technicraft Division of Electronic Specialty Co., and P. S. Klasky, United Electrodynamics Inc.

2:00 pm—Technical Session II—C. T. Wyman, Bell Telephone Laboratories, chairman.

The Influence of Extruder Flow Path Geometry in the Production of Homogeneous Cellular Plastic Insulation, E. D. Katz, E. O. Bauer, and P. E. Fox, Bell Telephone Laboratories.

Polymer Requirements and Insulation Techniques for High Density Polyethylenes, R. J. Ettinger, Goodrich-Gulf Chemicals Inc.

Wire Jackets of Nylon: Reliability=k (Extrusion conditions) N(polymer quality), E. C. McKannan & R. E. Shaw, E. I. duPont de Nemours & Co. Inc.

Simultaneous Extrusion of Polyethylene and Polyviny Chloride Coatings on Electrical Conductors, G. E. Henning, Western Electric Co.

An Adapter to Improve the Sensitivity of the Q Meter fo Dielectric Loss Measurements of Polyethylene, L. Rosenthal & T. Hazen, Union Carbide Plastics Co.

An Improved Oven for Accelerated Aging of Polyviny Chloride Insulation, R. M. Sherwood & S. J. Boronski Monsanto Chemical Co.

5:45 pm—Hospitality Hour

Thursday, December 1

9:15 am—Technical Session III—H. L. Wuerth, B. F Goodrich Chemical Co., chairman.

Coax Cable and Shielded Wire Terminations, M. N Brown, AMP Incorporated.

Silicone Compound Development & Quality Contro Through Use of the Mooney Viscometer, R. M. Savage General Electric Co.

Degradation of Polymers by External Corona Discharge R. F. Grossman, Anaconda Wire & Cable Co.

Heat Aging Studies of Chemically Cross Linked Polyethylene, A. E. Tarbox, Union Carbide Plastics Co.

2:00 pm—Technical Session IV—R. P. Houlihan, Gavit Wire & Cable Co., chairman.

High Density Polyethylene Insulation in Communication Cables, J. V. McBride, Plastic Wire & Cable Corp

New Low-Loss Balloon Type Polyethylene Insulation fo Telecommunications Cables, G. Fuchs and P. Verges Societe Anonyme de Telecommunications, France.

Construction Details and Processing Methods of Geophysical Cables, C. P. McKenna, Vector Manufacturing Co

A New Non-Twisting Armored Submarine Cable, G Palandri, P. G. Priaroggia, & R. Monelli, Pirelli, S.p.A Italy.

Unarmored Submarine Cable for Deep-Sea Carrier Telephony, by A. L. Meyers, Submarine Cables Ltd England.

Cable Splicing Utilizing New Silicone Materials, R. E. Kincaid, Dow Corning Corp.

8:00 pm—Banquet

Friday, December 2

9:15 am—Technical Session V—I. T. Stoneback, IT Laboratories, chairman.

New Fluorocarbon Insulation Compounds, W. L. Gore W. L. Gore & Associates Inc.

Recent Studies of Mineral Fillers in Butyl Rubber an Other Insulation Materials, W. F. Fischer, Enjay Laboratories.

The Irradiation Induced Elastic Memory of Polymers V. L. Lanza and P. M. Cook, Raychem Corp.

The Application of Electrical Cable to Missile Systems G. H. Morgan, Douglas Aircraft Co. Inc.

Production by Autogeneous Extrusion, A. N. Gray, Consultant.

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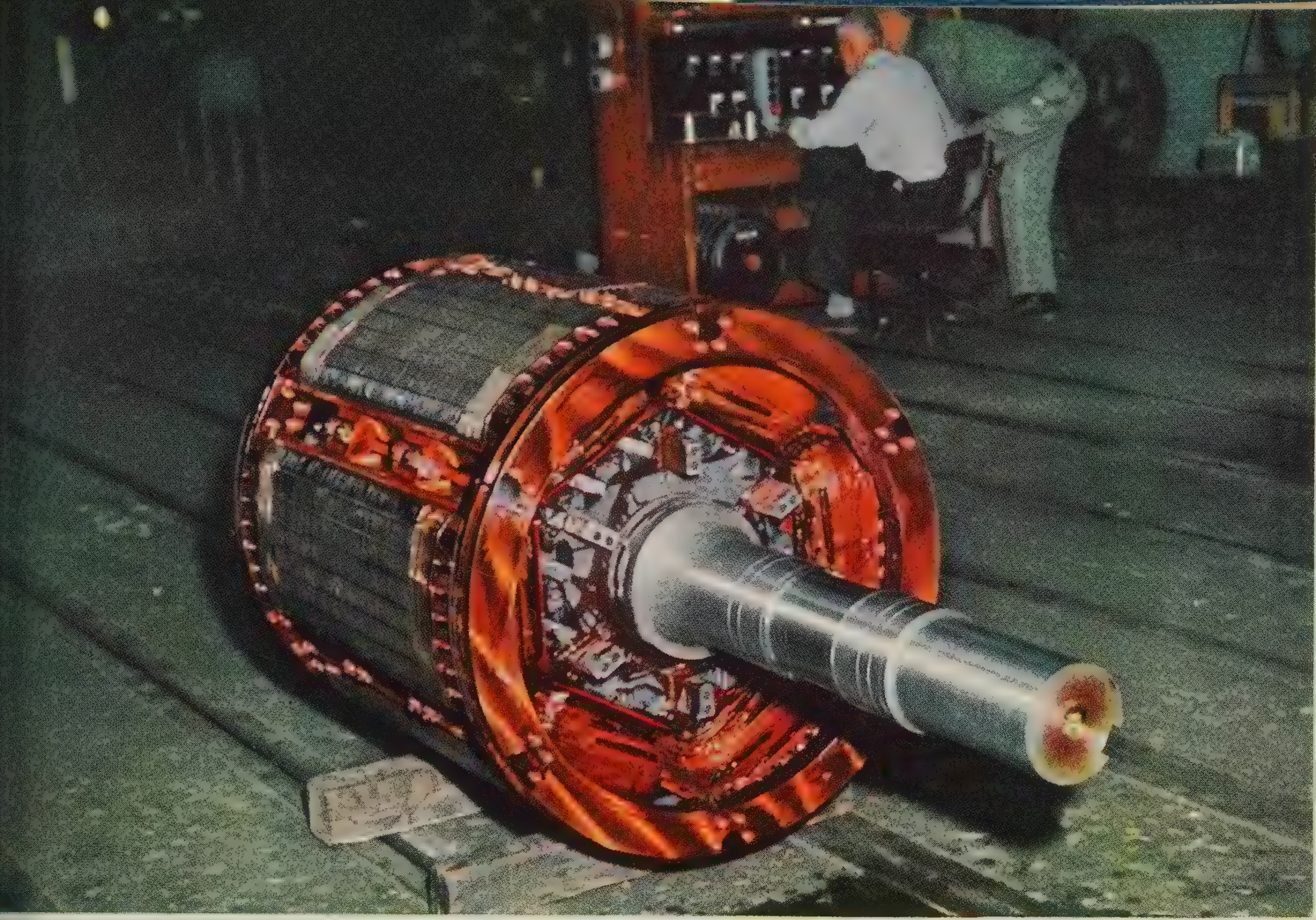

ANACONDA SILOTEX—THE ALL-GLASS-INSULATED CLASS H MAGNET WIRE WITH EXTRA OVERLOAD PROTECTION

300C operation continuously for over 5000 hours before ailure—this is the kind of high-temperature punishment withstood by a motor wound with Anaconda Silotex Magnet Wire.

A leading American motor manufacturer conducted these severe thermal-overload tests to find out just what Anaconda's silicone-bonded, all-glass-insulated magnet wire could really do. The winding withstood a 66 per cent overload for over 5000 hours before failure.

Although Silotex is officially rated as a Class H insulation AIEE), capable of withstanding "hot spot" temperatures of 180C, resistance to high temperatures is only part of the eason why it gives long continuous service. It also has xcellent moisture resistance, outstanding dielectric strength.

Where this maximum overload protection is not necessary, and where mechanical abuse during winding may occur, fused Dacron* fibers are substituted for some of the glass, giving additional abrasion resistance. This *Silotex-D* is manufactured to the same rigid quality requirements as Silotex—and all of Anaconda's other magnet wire products.

Whatever your application, Anaconda has a glass or glass-combination insulation to fit your requirements—and in a full range of sizes—rounds, squares, and rectangulars. The next time you have requirements, contact your nearest Anaconda Wire and Cable Company district office for help in selecting the right glass-insulated magnet wire. Or—for more information, write: The Anaconda Wire and Cable Company, 25 Broadway, New York 4, N. Y. 60256

*duPont registered trademark

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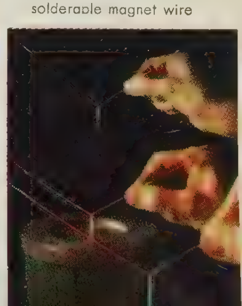
- high temperature resistance

NYFORM 105C (AIEE Class A)
superior windability

PLAIN ENAMEL 105C (AIEE Class A)
low-cost enameled magnet wire

FORMVAR 105C (AIEE Class A)
proven dependability

ANALAC 105C (AIEE Class A)
solderable magnet wire



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Or perhaps you need something much more "special." Thermoid Division engineers will work with you and develop the *right* tape that fits the unique demands of your job.

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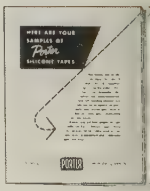

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The Climate for Invention

By W. H. Middendorf, Associate Professor of Electrical Engineering, University of Cincinnati, and Director of Research, The Cincinnati Development and Manufacturing Co.

Thus far during the age of technology in which we live, Americans have been able to contribute more than their fair share to scientific progress. From the advances made in basic scientific theory to the improvements in gadgets for the home, there seemed to be no rival to the claim of leadership until several years ago. Now, unhappily, there is some indication that we can continue that leadership only if we guard it with care. Perhaps some of our loss in superiority is caused by the well publicized shortage of engineers. However, even more than increased numbers of engineers, we need engineers with increased numbers of new ideas. This is indicated in a survey[1] made by an aircraft manufacturer for job advertising purposes. It was found from a random sample of engineers within the company, that the engineers with bachelor degrees held an average of 0.4 patent each, the engineers with master degrees held 0.6 patent each, and the scientists or engineers with doctor degrees held 2.3 patents each. The survey was published to show that people with more education are capable of more creative work but it also shows that the engineers working in an industry which should be fertile for invention and where cost of obtaining patents is not a deterrent, on the average have surprisingly few new solutions for their problems.

As another example, foreign delegates to the World Metallurgical Congress held in November of 1957 were asked about their impressions of American research in that field[2]. The comment of the French delegate is most challenging; "Your equipment is excellent . . . but you need more new ideas."

This need for new ideas is not a special need of defense industry. It is important to all industry. Improvements can create demand even more effectively than low prices; demand promotes prosperity for individual corporations; and through them, for the industry as a whole. It is especially necessary therefore, since the demand for goods as they are now produced seems to be unstable, that each industry look to its engineers to provide the improvements which will result in the revitalizing of America's business. It may well be that the future of each manufacturing company is locked to the creative abilities of its engineers.

Just as the production of new ideas is important to industrial activity as a whole and to the prosperity of individual corporations, so also the ability to invent is important to the engineering profession as a whole and to the individual engineer. The proficiency of engineers in developing new products and in improving old ones influences public opinion as to the engineering profession's value and deserved social status. This in turn influences the average wages paid to engineers as a group. To the individual, his status within the group is more important than the status of engineers as a whole. Here also one finds that invention is one of the most effective ways for the engineer to advance within the general class. The man who can produce new devices becomes known, by name at least, to competitive organizations and he is set apart as a more desirable engineer by the organization employing him. Both of these situations are valid reasons for such a person to receive more remuneration. The intangible advantage possessed by an engineer who holds patents in seeking new employment or increased wages should make every engineer actively engage in developing his creative talents.

Since both employers and employees can benefit from invention it seems appropriate for both to actively engage in an effort to increase the production of new ideas. With few notable exceptions[3], it has been characteristic of engineers and industry to act as if nothing can be done to foster creativity. Industry waits for inventors to appear by chance and engineers wait for ideas to appear by chance. It is the purpose of this article, therefore, to report the consensus of opinions given by investigators of the inventive process and to make recommendations to engineers and to industry in an effort to stimulate creativity. However, before recommendations to improve the situation previously described can be made, it is necessary to answer three important questions. They are:

1) What kind of person invents and by what characteristics can he be recognized?
2) What is known about the inventive process?
3) Are methods available to stimulate invention?

As with all areas involving human endeavor, there is no complete agreement by investigators in answer to the three questions. Fortunately however, for our purposes, it is necessary that we consider only the less controversial aspects.

What Kind of Person Invents?

In answer to the first question; it should be realized that invention is not the sole property of those with great intelligence or advanced degrees. The more intelligent and the more educated will produce more complex and important advances but those of average intelligence and education do invent and, for an organization engaged in manufacturing, the invention of a new fastener by an average person may be more valuable than a great advance in the theoretical understanding of their product by a genius. Whether or not a person will produce valuable innovations is more a result of personality characteristics than of high intelligence or advanced education. Thus, educational and intelligence requirements would not preclude most engineers from being taught to invent. Of course having every engineer develop inventive talents is not feasible. Among the engineering manpower there are a certain number who would find such endeavors most satisfying. It is those who should be culled and given an opportunity to invent. The literature is convincing in stating that these persons will have the following necessary characteristics:[4, 5]

a) they enjoy work,

b) they evaluate everything they see or hear,

c) they do not hesitate to think unconventionally,

d) they are able to mentally visualize things and relations,

e) they like to learn things previously unknown to them,

f) they feel a need to prove the superiority of their own ideas.

The employer should note, first, that these same qualities that are necessary for invention make it difficult for a creative person to be a docile employee. Nonetheless, the possibility of some slight conflicts seems to be a small consideration in view of the benefits which may be gained from such persons. Secondly, the need to prove the superiority of their ideas indicates that one reward that the inventor wants is identification with his creations. This can be an important factor in fostering the will to invent. It may also be one of the main deterrents to group inventing. Most people will give a quick offhand answer during a group participation project but few are willing to scour the depths of their understanding for something to be later called company A's improvement. And significant improvements require more than superficial thought. Lastly, it should be noted that some of these characteristics are so generally found in every engineer that it is extremely difficult to decide by a superficial test who can be an inventor and who cannot.

The Inventive Process

In answer to the second question, the process by which people invent has been studied at length.[6] Included in almost all published descriptions of the inventive process are the steps:

Define the problem.
Acquire knowledge.
Seek many solutions.
Learn and generalize from the solution found.

Throughout the whole process, there is need to return to previous steps to refine the work done. Quite frequently the first several solutions found simply aid in forming a more adequate definition of the problem. There is also a need for incubation; a time to let up and invite illumination. Thus, from the known steps in the process of inventing, it is obvious that the engineer must be aware of the problem, he must understand the theory and practice surrounding it, he must have time to reconsider previous decisions, and he must be able to get away from his problem to attack it anew after a period of gestation. The inventor cannot invent in a hurry; nor can he efficiently spend forty hours a week pursuing the solution to his problem. He can, however, be occupied by other work during much of the gestation period.

Methods to Stimulate Invention

If invention is to be fostered, the engineer must have ways of arriving at alternative solutions and constantly re-evaluate them. Thus in answer to the third question, methods are available which stimulate the inventive process. Brainstorming is one such method. It is so well known and so popular that examples have appeared in newspapers and magazines.[7] It is unnecessary to explain the technique in this article. However, brainstorming seems to have passed its peak of popularity and recent studies[8] indicate it can inhibit invention. At the very least, it does provide an opportunity for participants to exchange information with a consequent increase in the knowledge stored by the would-be-inventor.

Another method[9] to aid in invention contrasts to brainstorming in that it is less well known and can be applied by individual effort. Since this method is relatively new and unpublicized, a brief discussion seems appropriate. It is called orderly creative inventing in the reference paper. This method has as one of its most important steps the describing of the sought-after device in terms of functional requirements. Thus, the inventor constructs the soul of the device and then looks for suitable bodies in which to encase it. This method allows a would-be-inventor to sta with an existing device; transfor it into a set of functional requir ments; and then countertransform to as many physical embodiments a possible. This, very often, will give physical embodiment which is an improvement over the model used t start the process.

In the reference paper, the step of the method were applied by way c examples to the development of a device for a given use and of a proces for a given manufacturing problem In some situations, engineers ar called upon to discover new use for a given product rather than new product for a given use. In othe words, the problem is just opposite t that described in the previous pape It has been found that the steps c orderly creative inventing when fo lowed skillfully in this reverse problem give success comparable to tha obtained for the direct problem.

Finding New Insulation Applications

The steps of this method are be taught by an example. Suppose th problem is to discover new applications for fiber glass reinforced polyester sheet insulation. The steps of th orderly creative method proceed a follows.

Step 1: Definition of the problem– Find novel applications for glas polyester sheets.

Step 2: Gather information—Muc time should be spent on this part c the method. In fact, after an initi search of literature and some preliminary work to narrow the problem, it is often rewarding to searc the literature again.

Step 3: Divide the problem—In th reverse problem, division usually r sults in examining, in turn, applications for the whole product and f each major constituent. However, th problem chosen here involves onl one entity.

Step 4: Transform the product into set of attributes or parameters—Her indeed is where skill in setting dow the proper descriptions is importan It is necessary in this case, for e ample, to consider not only the phys cal attributes but also manufacturin processes and fabrication methods the materials. These can be com pared to the subunits described in the reference paper. Table 1 gives the appropriate information for this example.

In carrying out step 4, all the attributes which have any possibility of bearing upon the situation should be included. Perhaps some which the reader knows are unnecessary are included and others which are important are not there. Step 2, the gathering of information, was not actually fulfilled in working this example. With more preparation this defect would not occur.

Step 5: Make a list of products that are described by the attributes taken in all combinations—In this step, the would-be-inventor must show originality. No claim is made that this approach eliminates the need for this fundamental part of invention. The point is, however, that by studying only the attributes of the product, all the untold number of products with similar characteristics will pass the mind of the gifted investigator and in so doing, may suggest the new application sought.

In this example, when one considers the attributes of high strength and ability to fabricate by punching, all applications of metal which require only those attributes should be considered. This is not a fast process but can be rewarding enough to merit the time spent. When another attribute, that of high electrical resistivity, is added to the preceding two, one then should consider all applications where punched metal parts have portions covered with insulation. For many years dead fronts of switchgear used this construction. Now a single piece of glass-polyester does a more acceptable job. As a third example of combining attributes, consider the high electrical resistivity with the manufacturing attribute of sandwich positioning of constituents during manufacture. This immediately suggests conductors imbedded with the sheet as would be appropriate for printed circuits, conductor-imbedded mounting plates for circuit breakers, or heating units.

Table 1

Subunit	Attributes or parameters
The glass-reinforced polyester insulation material	a) high dimensional stability, b) high tensile strength, c) high electrical resistivity, d) medium thermal conductivity, e) low water absorption, f) high arc resistance, g) self-extinguishing to flame, h) high dielectric strength, and i) high impact strength
The manufacturing technique of the material	a) a finished sheet each press stroke, b) sandwich type positioning of glass mats before press stroke, c) no movement of constituents during manufacture, and d) self-sealing sheet edges
Fabrication techniques to make other products	a) desirable punching, b) shearing, c) drilling, d) tapping, and e) machining properties

Step 6: Select the more promising solutions for further study—As the engineer studies the list of possible new products derived from the list of attributes, some applications will seem more natural for the product than others. These, of course, are the ones that deserve continued consideration. In following an orderly approach as described in reference 9 and extended here, the engineer is most likely to hit upon some new applications for any product he considers. Also there is no reason to exclude this approach from sessions where a group participates. Its advantages of breaking the problem down and thinking only in terms of functions or attributes can be a valuable aid in group response. Probably the most productive situation is a skillful combination of group and individual effort. Group effort supplies the breadth of ideas whereas individual effort supplies the depth of thought.

Fostering Creativity

An understanding of the characteristics of the inventor, the inventive process, and methods of inventing suggest an outline for a program to foster creativity within the grasp of most industrial organizations. The first step is to increase the information available to the engineers about the company's products and related products. This information should take all forms from advanced theory to advertising details. It should include related products also, since sometimes ideas for improvements come from similar devices in other fields. Most important as a source of information is a well-ordered patent file.[10] One of the necessary parts of a patent is a statement of the object of the invention; this can suggest a problem to the engineer who can then seek a new solution. Unless the engineer becomes aware of a problem, there is no chance for invention.

As a second step necessary to foster creativity, it is suggested that the industrial organization allot time for the engineers to search for problems and solve them. This can not be done during odd moments of his regular workday. He should be assured that he will not be bothered by the usual never-ending emergencies as he seeks to solve the problem he initiates. Of course, there must be restrictions or the present customers would be sacrificed for future inventions. It seems reasonable, however, that one afternoon a week be set aside for creative development of the engineer. At first this should probably be done on the basis of participation by all engineers. Remember invention is not limited to the ones who received good grades in college! After a while, it may become apparent that some are not interested in invention. They should then be assigned other tasks with the option of returning to invention if their interest grows.

At first one would expect all engineers of a given company to be assigned the same afternoon for this work. This uniformity would permit brainstorming sessions to take place periodically (perhaps once a month) with all engineers explaining their projects and soliciting suggestions which may lead to new approaches. However, brainstorming should not be done to such an extent that the individual loses identification with "his" problem. At other times, each person should plunge deep into the method of orderly creative inventing. There are times when the inventor will be bubbling over with an idea and it will be best not to make him wait to try it. Other times, the person may not feel mentally or emotionally equipped to do creative work on the assigned day. It is also conceivable that this program will help discover certain persons so talented that they be given complete freedom. Thus, one can see a certain need for flexibility in the selection of persons and the scheduling of this respite from the usual chores.

At first the plan may sound a bit too liberal. When one counts the man hours and multiplies this by an average hourly rate it may be shocking. But the return can very easily exceed the cost. In essence, the plan suggests that merely ten per cent of the engineer's time be devoted to developing his creative talents along the lines of interest to his employer. Actually, if certain engineers have a compulsive desire to invent, they may put in many hours outside their work-week planning, mulling over, and re-evaluating their project. In fact, such a program could increase the interest in their job and the company for which they work to such an extent that more of them bring their minds to work instead of just delivering the body.

As the third step necessary to foster creativity, it is suggested that every organization take pains to emphasize, with acknowledged pride, the inventive accomplishments of their engineers. It is not unusual to see cups displayed in office lobbies showing the accomplishments of the company's athletic team but seldom are there displays of the inventions incorporated in their products. Is the name of the inventor ever displayed? If the inventor needs recognition as one of the basic rewards of invention, industry is not filling that need.

If an organization follows these recommendations they will certainly be providing the climate for invention. This is a necessary but not su ficient condition for invention. Be sides the climate, invention relie upon persons whose characteristic have been described. If he is re minded of the benefits of being a inventor, the creative engineer wil certainly make every effort to increas his storehouse of knowledge and de velop a critical eye with which to view everything that has been done. If h earnestly desires to be an inventor an practices the techniques available t him, in a climate conducive to crea tivity, invention is likely to result.

References

1. Electrical Engineering, Jan. 1956, p. 61A.
2. The Iron Age, Nov. 14, 1957, p. 113.
3. Creativity Can Be Developed, C. F. Hix and D. Purdy, General Electric Review, May 1955, p 20-23.
4. Characteristics of the Creative Engineer, G. Spencer, Mechanical Engineering, Feb. 1958, p 78-80.
5. The Creative Process, E. K. Von Fange, Jou of Engineering Education, Mar. 1955, pp. 508-13.
6. Understanding the Creative Process, E. K. Vo Fange, General Electric Review, July 1955, p 54-57.
7. This Week Magazine, May 26, 1957, p. 8.
8. Brainstorming: Cure or Curse?, Business W New York, N.Y., Dec. 29, 1956, pp. 44-8.
9. Orderly Creative Inventing, W. H. Middendorf a G. T. Brown, Jr., Electrical Engineering, Vol. 7 Oct. 1957, pp. 866-69.
10. Are Patents Helping You Solve Your Problem H. L. Swenson, Allis-Chalmers Review, 4th Quart 1957, pp. 25-28.

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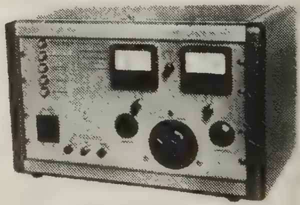

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Varnish Dip Tank Saves 60% Space

As much as 60 percent of floor space reportedly may be saved through a new dipping system in which a dip tank for applying varnish insulation to stators and electric motor windings automatically moves upward to immerse the work, then recedes to enable the latter to continue onward.

The development also is reported to provide good control of work withdrawal and constant level of varnish. It is flexible enough so the servicing conveyor of the tank can be halted to allow a longer period of work drainage if necessary. The system was developed by Industrial Equipment Div., The R. C. Mahon Co., Detroit.

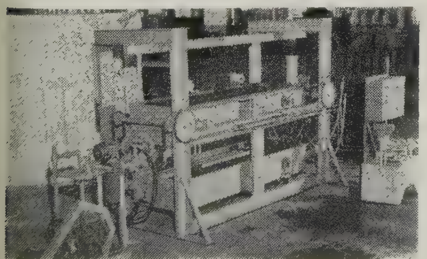
Normally, the work moves on a conveyor that dips into a stationary tank. After immersion, via conveyor it gradually climbs out of the tank. The tank usually is extended considerably to provide extra space for gradual work withdrawal and drainage.

In the newly-developed system, two tanks, one over the other and only 8 feet long, are built into an operating unit that occupies a floor area only 6 feet wide by 14 feet long.

As in conventional procedures, the conveyor from the preheat oven runs over the upper or dip tank of the system, but is designed so it can be stopped to "spot" the work (suspended from hangers) directly over the dip tank for immersion.

As the conveyor stops, it triggers a limit switch, and the upper tank (in lowered position) rises to immerse the work. As this movement takes place, the lower or varnish storage tank moves downward. After immersion, the tank movements are reversed.

The lower tank serves as a counterweight in the movement, keeps the varnish in the dip tank at proper level, and holds the coils to cool the constantly circulated varnish.



The unit shown is said to be capable of dipping 340 items per hour.

Improved Measuring of Abrasion Resistance

Improvements made in a method of measuring abrasion resistance of protective coatings are said to have significantly increased the speed, ease, and precision of the measurements.

In the basic National Bureau of Standards Abrasive Jet method, pressurized gas propels an abrasive powder from a vibrating storage chamber through a nozzle onto the test specimen. Abrasive flow, pressure, distance, and angle are all closely controlled. Abrasion resistance is measured by the time required to abrade through the coating and is expressed in terms of a unit thickness. The high speed of the particles in the abrasive jet provides a rapid rate of abrasion that permits most coatings to be tested in a matter of seconds. The abrading conditions can be varied over a wide range to permit the testing of virtually any type of coating.

The use of a reference panel for calibration and standardization purposes has become an important part of the improved procedure. The values recorded for the reference panel also provide a reliable means for reducing data obtained under different conditions to a common basis for comparison. The coefficient of variation for measurements on the reference panel is less than two percent.

Other improvements include closer control of the amplitude of vibration, reduction of undesirable turbulence and interference effects in the abrasive storage chamber through redesign of the chamber, use of a more free-flowing abrasive (aluminum oxide) to improve the uniformity of operation, and new devices for setting and adjusting nozzle-to-coating distance.

Studies have shown that the method is not limited to the organic coating materials for which it was originally designed. It is also applicable to ceramic, porcelain, and anodic coatings, as well as films and tapes when attached to a rigid substrate.

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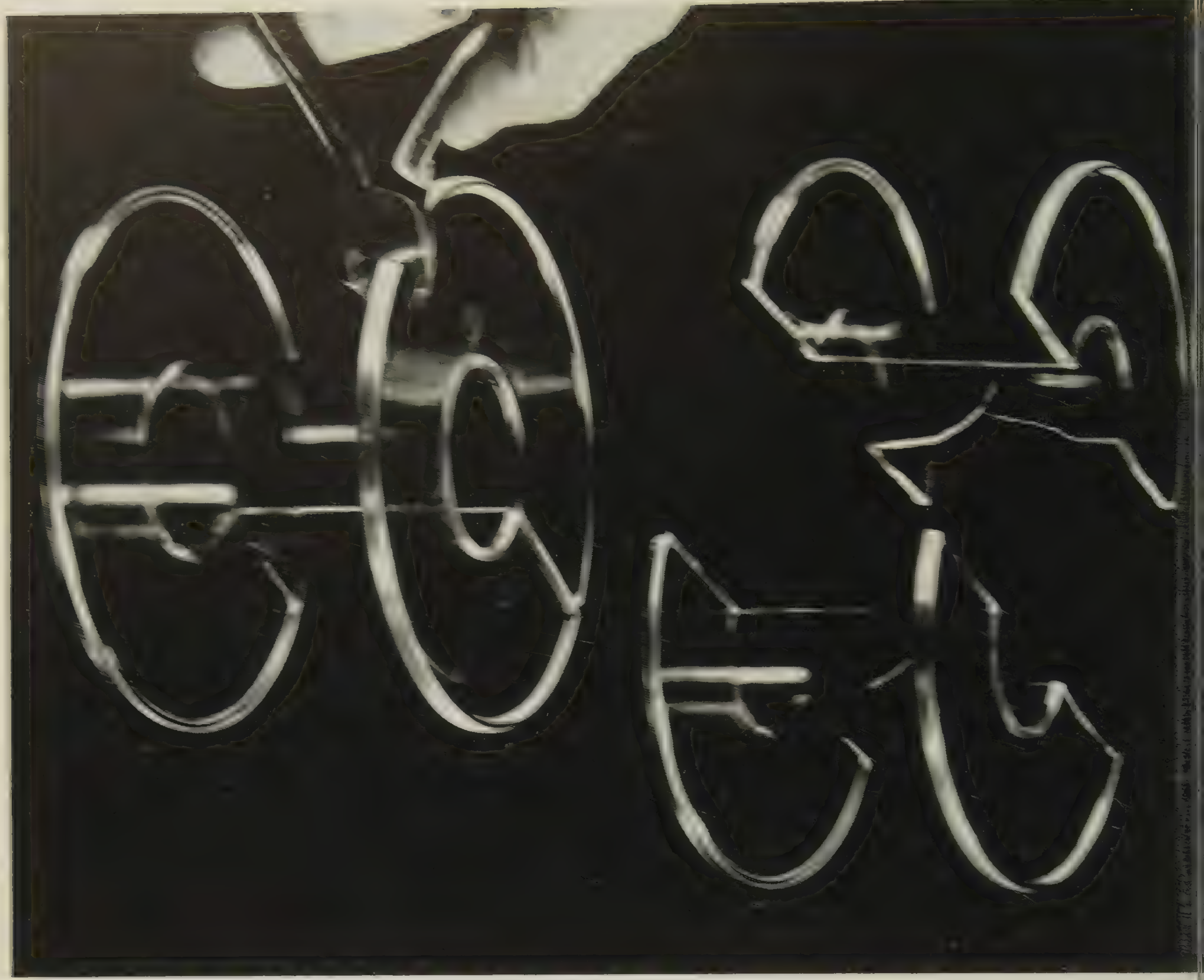

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IMPROVES QUALITY Now you can use yarn packages with increased [illegible] . . . get smoother delivery of yarn to the wire with minimum abrasion, fuzzing and skips. Flanges are always in position, protecting the yarn—and the transparent plastic lets the operator see how much yarn remains on the package at all times.

REDUCES COST Use low-cost glass yarns at no sacrifice in quality! These new serving packages permit the use of low-twist yarns with improved starch-free binder that protects the yarn from abrasion. Low-twist yarns also assure the same finished wire diameters as more expensive plied yarns.

Johns-Manville all-plastic serving packages are available in two head diameters: [illegible] and [illegible]. For complete information on this new development in magnet wire production, write to Johns-Manville, Box New York 16, N. Y.

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Rapid Identification of Magnet Wire Type By Reflectance Infrared Spectroscopy

By [illegible] and [illegible], Shawinigan Resins Corp., Springfield, Mass.

The advantages of infrared spectroscopy applied to organic coatings on metal substrates by a reflection method were recently described. With a special reflectance accessory and a commercial spectrophotometer it is possible to obtain spectra of thin films of polymeric materials coated on reflective surfaces. These are essentially absorption spectra since the light beam, by an arrangement of mirrors, is passed through the film mounted on a reflecting substrate, then back again through the film a second time, and into the spectrophotometer.

Analysis of Wire Coatings

A specific example of this principle that has been in use in our laboratory for over a year is the rapid analysis of magnet wire coatings on the wire. A flat surface is first obtained by pressing a small straight piece of wire between steel plates, and then a plane of suitable size is formed by placing several samples side by side on the reflectance accessory.

Flattened magnet wire, as a reflecting substrate, is less effective than a polished metal plate on which a polymeric film might be cast purposely for infrared analysis. Efficiency with a magnet wire sample is sufficient, however, to make the method workable and useful. Efficiencies of [illegible] were measured for plane surfaces of [illegible] steel, buffed aluminum, copper, brass, and phosphor bronze. For magnet wire this must be taken [illegible] and only about [illegible] of the effectiveness of a transmission spectrum can be expected by this reflectance method. Fortunately, one can easily compensate for this in a double-beam infrared spectrophotometer by throttling the reference beam.

A second departure from desirable [illegible] should be avoided in magnet wire analyses in thickness of film. For surface coatings 1.0 to 1.5 mil thick will produce good spectra, but "the thickness of films should be only about one-half the thickness used for infrared absorption spectra obtained by the transmission method as the light passes through the film twice in the reflection method." The thickness of a [illegible] "heavy" magnet wire film prior to pressing is about 1.5 mils, and after flattening will vary from more than 1.5 at the center of each piece to less than 1.5 at the edges. Small wire sizes, e.g. [illegible], and [illegible] films of [illegible] thickness are more difficult to prepare as useful infrared specimens. Fine wire lacks the stiffness to maintain a flattened surface [illegible]

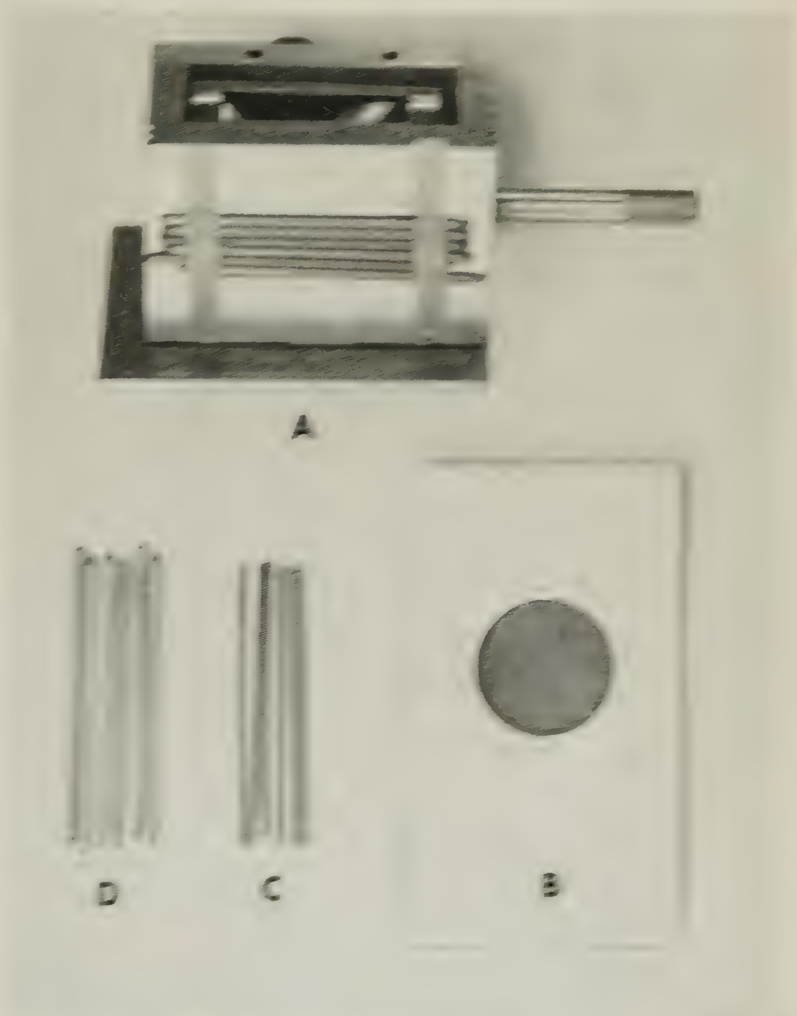

Figure 1. A—Reflectance accessory with sample mounted. B—[illegible] C—[illegible] pieces of [illegible] magnet wire; D—[illegible]

handling, and efficiency further falls because more pieces are required to make the test sample. Qualitative identification can be made in many cases, however, by careful manipulation. Our experience has included wires down to #38 AWG.

Other methods of utilizing infrared analysis on magnet wire coatings include analysis of pyrolyzates[2], and analysis of extracts.[3] If enamel is available, cured films may be prepared for spectroscopic examination by either transmission or reflectance. For analysis of the wire coating proper an oil mull or a KBr pellet can be prepared, but it has been our experience that this is difficult due to the tough, rubbery nature of the cured films. For the preparation of mulls, a Pyrex ground glass joint of the ball and socket type has been suggested,[4] or a pair of ground glass plates.[5] Hummel examined many wire coatings utilizing the KBr pellet method.[6]

For most purposes, including all qualitative applications, the reflected light method of analysis is much preferable because of rapidity and absence of interfering peaks from mulling oils.

Preparation of Sample

A small sample of wire is straightened by elongating 5% and then cut into six pieces exactly 2″ in length. A pair of these are placed side by side, ¼ to ½″ apart, in a hydraulic press between hardened steel plates, and pressed with a 25,000-pound force. This procedure is repeated with the others, a pair at a time. Flattened pieces of #18 wire will have the approximate dimensions: 0.075 to 0.090″ wide by 0.017 to 0.020″ thick. The six pieces are placed side by side to make one reflecting surface and mounted on the reflectance attachment with masking tape.

Considerable latitude in pressure is possible for flattening samples, but an upper limitation is usually necessary due to longitudinal cracking. As great a pressure as possible is desirable to make areas large and films thin, but a point will be reached with most wire coatings where the film no longer yields smoothly to the force applied. Longitudinal cracks will appear which detract from efficiency, and they may become numerous enough to make a specimen useless. A 25,000-pound force for a pair of 2″ wires is about right for most samples.

Wires finer than about #26 AWG are difficult to keep straight for flattening as 2″ pieces. They are better handled by taping larger pieces, say 6 to 8″, to one of the steel plates, and hand straightening by pulling the ends. Then after pressing, the large pieces may be cut into 2″ segments which *will* remain straight despite handling.

Very small samples of wire may be analyzed if necessary. Although six flattened pieces of #18 wire are required to fill the sample aperture of the Beckman reflectance accessory, a lesser number will suffice. and a qualitative identification can often be made with only one.

Analysis Procedure

Reflectance accessories are available commercially for use with existing infrared spectrophotometers,[7,8] The techniques described here were worked out with the Beckman accessory and a Beckman IR-5 spectrophotometer.

The flattened sample pieces are mounted side by side on the reflectance accessory with masking tape (figure 1). Six pieces from #18 wire will fill the sample aperture. The reference beam should be throttled so that only a portion of it is transmitted. Some spectrophotometers are equipped with shutters for this purpose, but in their absence, a piece of metal screening is very effective and is always reproducible. In the Beckman IR-5 a piece of 100 mesh screen reduced the transmission to 29% at 3 microns, and this screen was used for nearly all analyses. Thus, partial compensation is made for inefficiencies contributing to a much reduced sample beam, and significant absorbance peaks are magnified on the chart to useful proportions.

Results

A. Qualitative

Reflectance spectra for several commercial classes of magnet wire are presented in figures 2 and 3. These possess two notable common features, as follows:

1. The level of maximum transmission is low at 2μ, but builds up after each absorption peak to a high point at about 5.5μ, and in some cases higher, above 10μ. This is due to the changing efficiency of copper as a reflector over the spectral range[1]. Fortunately, it does not seriously detrac from the usefulness of the first third of the spectrum.

2. Distinguishing features between spectral curves are seldom available between 6 and 10μ, very probably due to film thickness. This is, happily, not always the case, but even if so, the ranges $2\text{-}6\mu$ and $10\text{-}16\mu$ provide many distinct points of difference.

Some of these characteristic features are as follows:

1. "Formetic" differs from "Formvar"/phenolic at 4.45μ (isocyanate peak), and at about 6.4μ, due to the presence of polyisocyanate.

2. Hi-cut-through "Formvar" and solderable Formvar / polyester / urethane wires also show the isocyanate peak at 4.45μ, but the latter has unique peaks in the final third of the spectrum.

3. Epoxy wires absorb very heavily at 12μ.

4. Polyesters have many characteristic peaks over the whole spectral range, and usually display more resolution than other wire types over the $6\text{-}10\mu$ range.

5. Acrylic coatings show the very sharp nitrile peak at 4.5μ, a little to the right of the usual position for isocyanate. The $10\text{-}16\mu$ range is also unique.

6. Nylon has a very characteristic spectrum and some of its peaks are important in that they make it possible to detect nylon overcoats. These are the following:

   a. Small peak at 3.3μ between two larger ones at 3.1 (NH) and 3.5 (CH).

   b. Amide carbonyl peak at 6.1μ.

   c. Peak at 10.7μ.

B. Quantitative

It has been suggested that accurate quantitative work is difficult or impossible with reflectance infrared techniques, but that semi-quantitative estimates may be made[1]. Such estimates may be very valuable in mag-

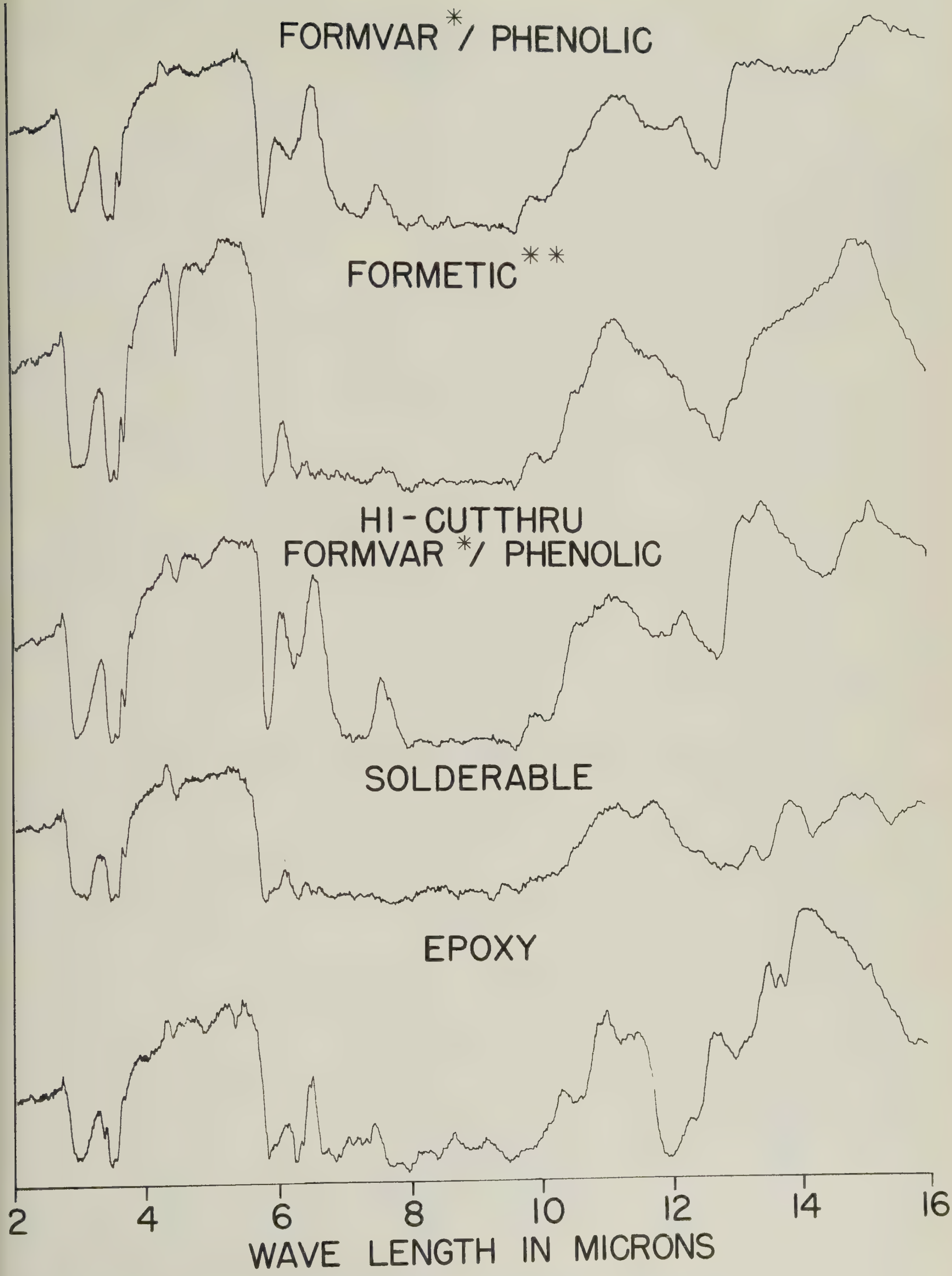

Figure 2, reflectance infrared spectra of magnet wires.

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***Trademark of Shawinigan Resins Corp. for modified Formvar/urethane (hermetic) compositions.*

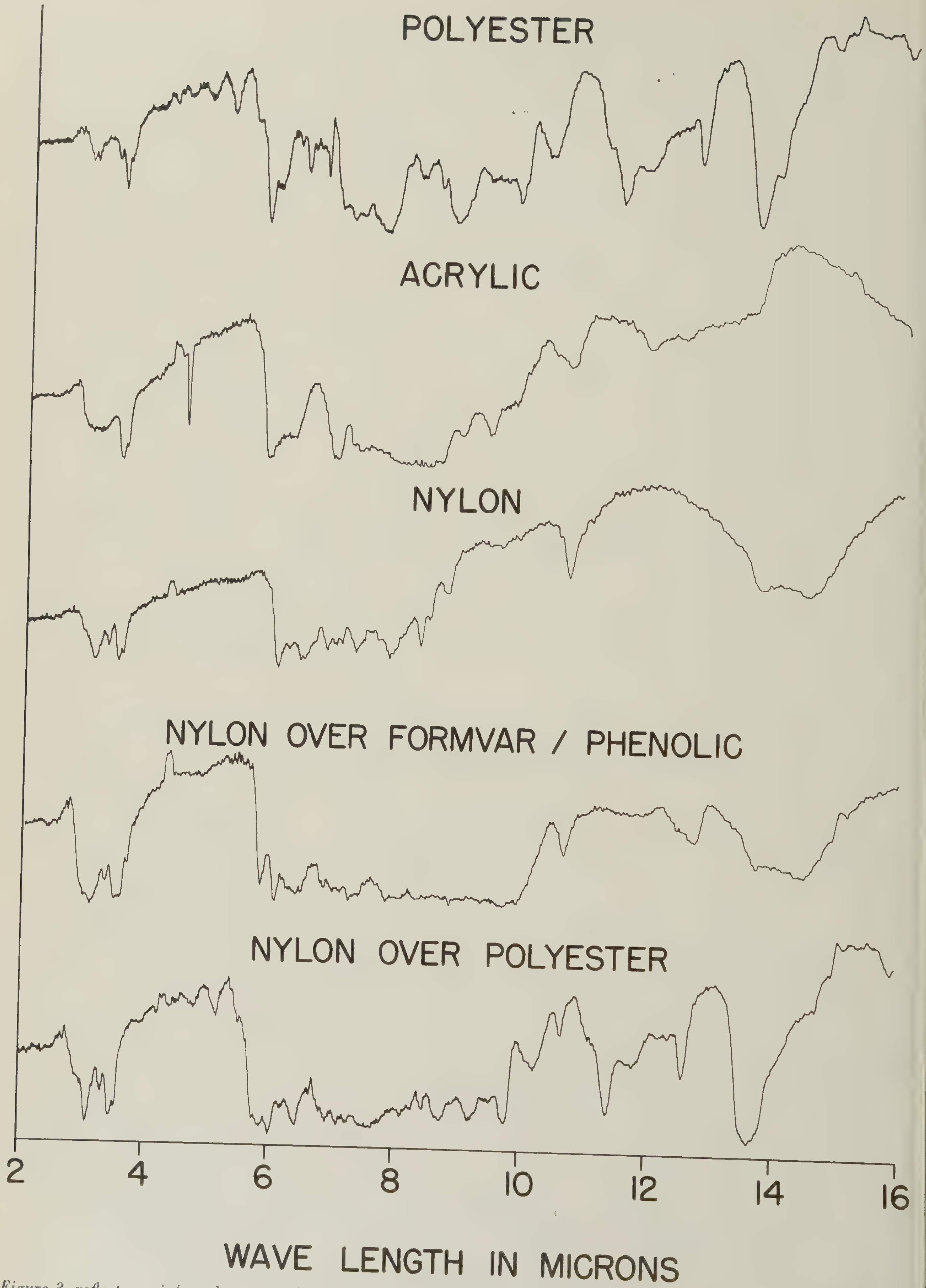

Figure 3, reflectance infrared spectra of magnet wires.

net wire research, however, and where rapidity of analysis is also a factor they should be attempted.

An example of such an application concerns changes that occur to some absorption peaks over a cure range of several wire speeds. With "Formetic" enamel the isocyanate peak becomes measurably smaller with increasing cure. In the early stages of development of this enamel it was thought possible that a practical application of the rapid infrared analysis might be the close control of optimum cure. Separate standards for each build on each wire size would be necessary, however, so that the method is of doubtful practicality. Furthermore, additional improvement to the method became unnecessary when "Formetic" enamel formulations were worked out having a very wide optimum cure range.

Other examples of semi-quantitative estimating may include the comparison of similar formulations, comparison of aged wires and solvent-extracted wires, and determination of rates of change of absorption peaks with aging, cure, or extraction.

Summary

The infrared spectroscopic analysis of magnet wire coatings on the wire can be effected by a reflected light technique utilizing the copper wire substrate as a reflecting surface. Equipment is available commercially.

This is a simple, rapid, and very useful qualitative tool, and has been used on magnet wires as small as No. 38 AWG. Semi-quantitative estimates are also possible.

Acknowledgement

The authors wish to thank Dr. D. M. Gardner for valuable suggestions and discussions throughout the work.

References

1. Hans Sannenberg, J. W. Forbes, and A. C. Jones, Anal. Chem. *32*, 365 (1960).
2. D. L. Harms, Anal. Chem. *25*, 1140-56 (1953).
3. R. P. Arndt, "An Infrared Study of Solvent-Extracted Materials From Wire Enamels". Paper presented at the Pittsburgh Conference on Analytic Chemistry and Applied Spectroscopy, March, 1957.
4. R. P. Arndt, private communication.
5. A. Crook and P. J. Taylor, Chemistry and Industry, Jan. 23, 1958, p. 95.
6. D. Hummel, Farbe U. Lack *62*, 529-39 (1956).
7. Beckman Instruments, Inc., Fullerton, Calif., Bulletin *588*, 1958.
8. Perkin-Elmer Corp., Norwalk, Conn., Bulletin *103*, p. 19, 1952.

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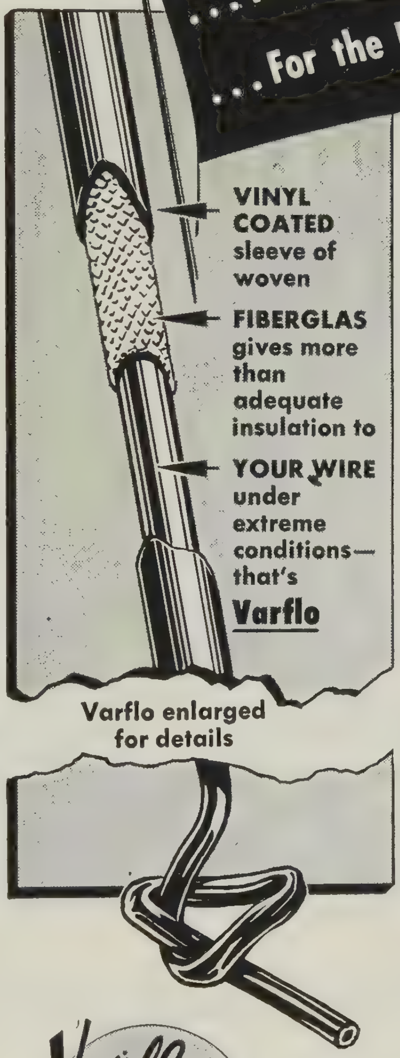
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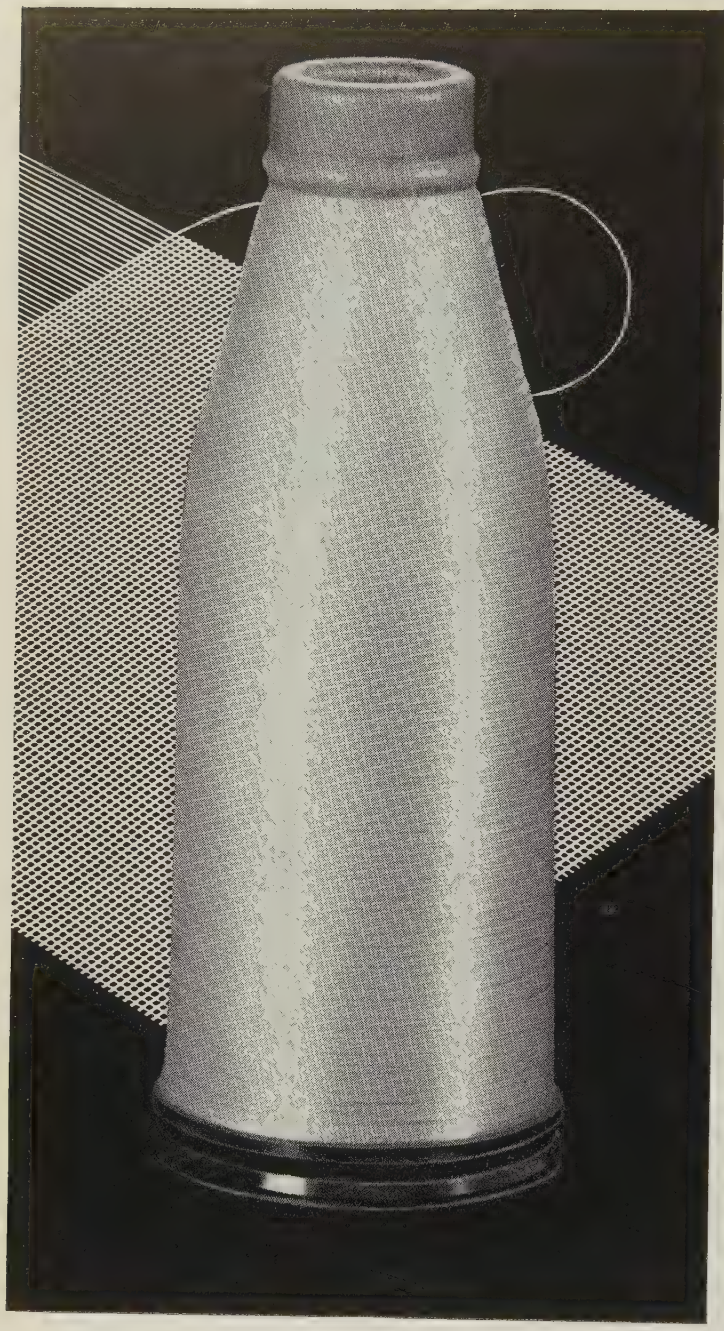

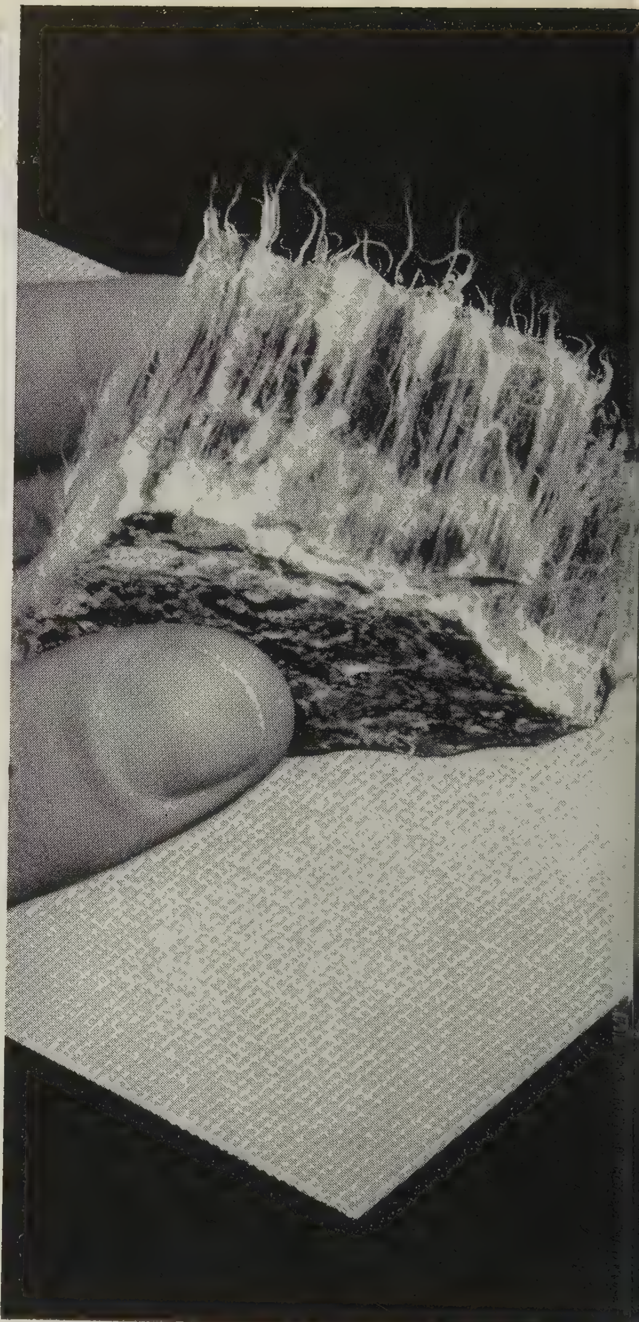

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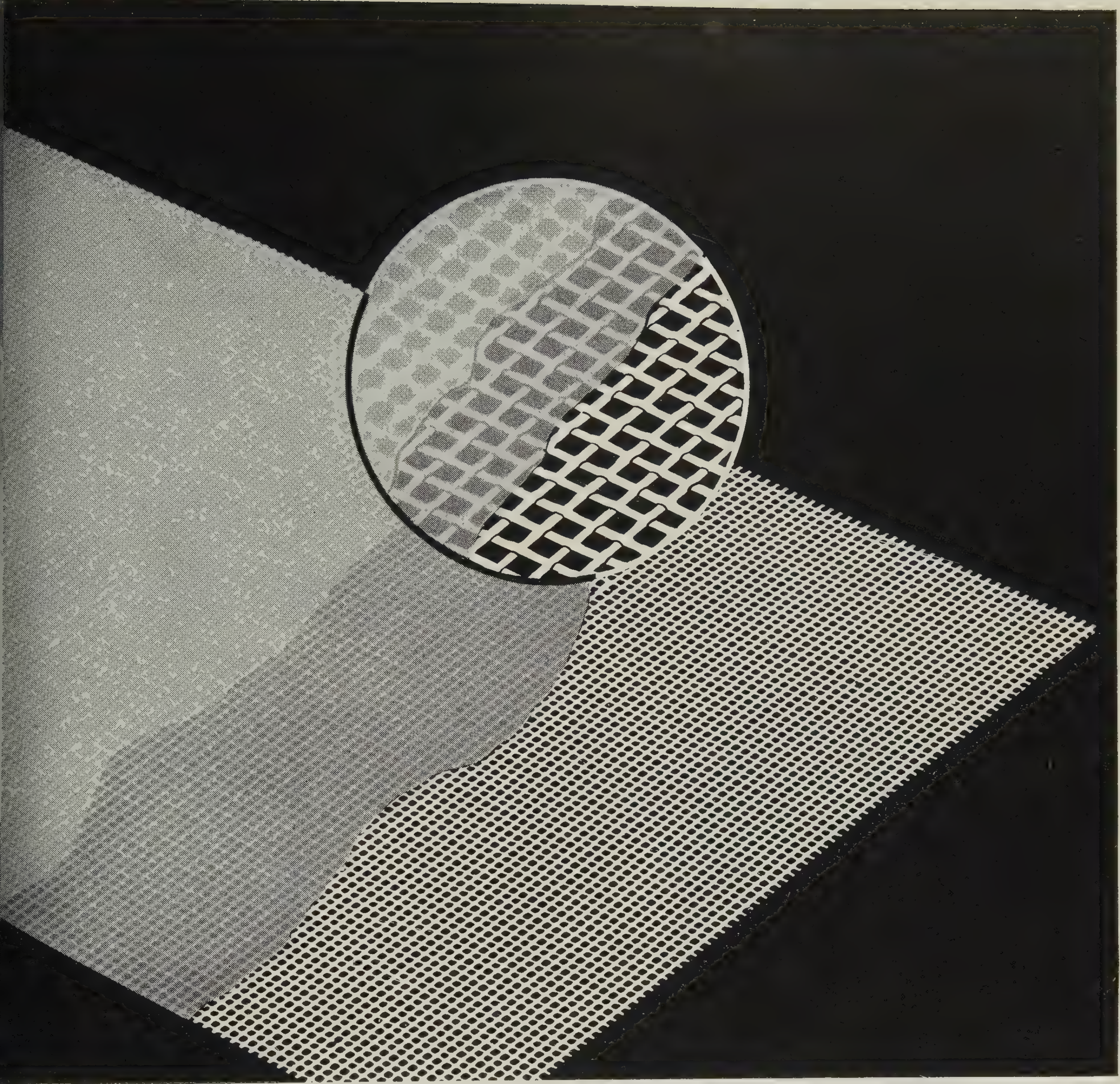

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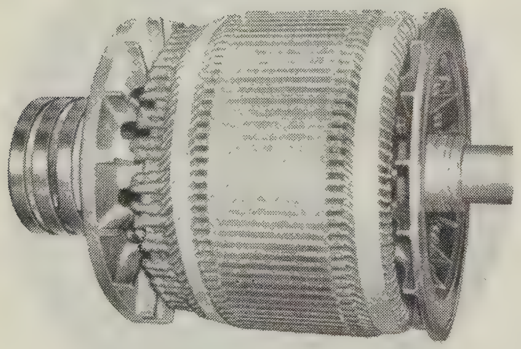

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Epoxy Impregnation Replaces Casting For Components

By Henry Hirsch, GPL Division, General Precision Inc., Pleasantville, N.Y.

A dip method in which electronic components may be simultaneously impregnated and encapsulated with epoxy resin has been developed to avoid some of the complications of conventional casting or molding procedures.

Since the advent of epoxy resins in the electronic industry, a great number of components have been encapsulated with these resins. The conventional approach, in most cases, has been to make a mold and after inserting the unit into it, cast resin around the component and cure the resin within the mold.

Protection against environmental conditions is achieved with this mass cast about the unit. It is protected against thermal shock, ignition, and moisture encroachment. However, this method of casting creates a problem because a special mold is required. Since the cast cross section is of appreciable mass, the unit may require special design characteristics to provide protection against thermal shock.

Consequently, the engineer has to contend with weight or size limitations which are often important factors in component design. Molds are usually expensive since sharp edges and corners must be eliminated to prevent cracking when the potted or cast unit is subjected to thermal cycling. Even where recoverable low temperature alloy molds can be used, such as "Cerrotru," or where plastisol molds may be used, the original cost of making a master is considerable. Moreover, a master must be made for each different unit and the expense

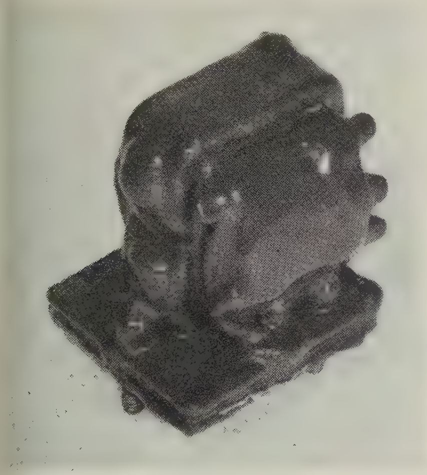


Figure 1, step-down power transformer impregnated and encapsulated with epoxy resin by the new dip method.

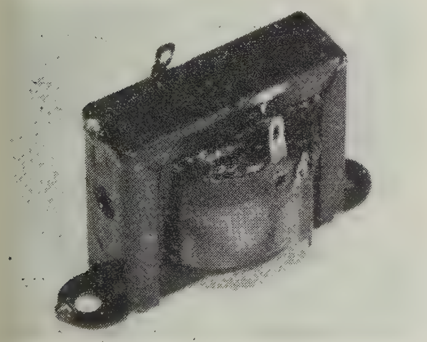


Figure 2, epoxy impregnated and encapsulated choke was cycled from 180°C directly into a dry ice acetone at —80°C without failure for five cycles.

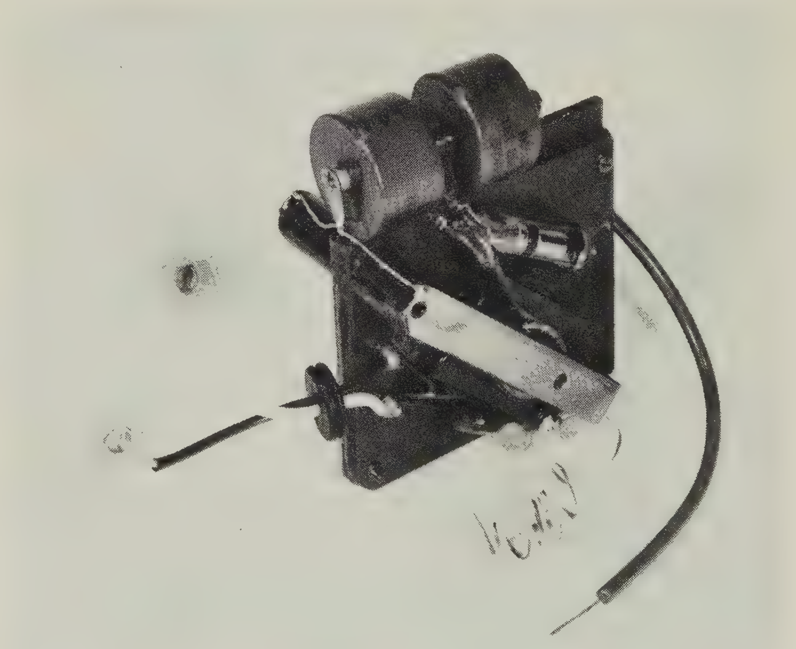


Figure 3, high resolution transformer treated by the new process also successfully met thermal shock requirements.

can be disproportionate for smaller scale production runs. The cure time involves tying up the molds for a number of hours and creates production barriers.

Despite these complications, epoxy resins have provided the widest range of environmental protection and insulation properties. Obviously, preserving these advantages while avoiding the complications of casting or molding is a desirable goal.

Before the advent of the epoxy resins, electrical components, such as transformers, motors, etc., had bee given protection by impregnatio with phenolic varnishes or asphalti compounds. Thereafter, other plastic were employed to meet environmenta conditions. It is commonly accepte that these materials were not adequat for the requirements; however, process which retains the virtues o impregnation and at the same tim encapsulates while avoiding the com plication already cited is a great ste forward.

The process developed is a dippin method utilizing an epoxy resin spe cifically designed for the purpose. I the dipping, impregnation and encap sulation are accomplished simul taneously.

The vacuum equipment used mus be of excellent quality and at the sam time, pressure should be used to forc the resin into the windings. The usua cycle is 15 minutes at 30 inches o mercury, and after that a pressur of 45 psi for about 5 minutes.

In order to have a better unit fro all aspects, it is necessary to repea the impregnation of the componen once more under a vacuum of 3 inches for 10 minutes and the sam pressure for 5 minutes. After a quic gel, the unit is flash dipped and the cured for about six to eight hours a 250°F. If the unit is to operate abov 250°F, it is necessary to post-cure a 300°F for twelve hours.

The resin is a two-part epoxy wit 40% filler. The viscosity at 150°F i around 3000 centipoises. At that tem perature the pot life is about eigh hours. Since the resin is used inter mittently at this temperature, actua pot life in use is about seven days. It shelf life (unmixed) seems to b indefinite.

To prove that units so dipped woul meet the environmental condition

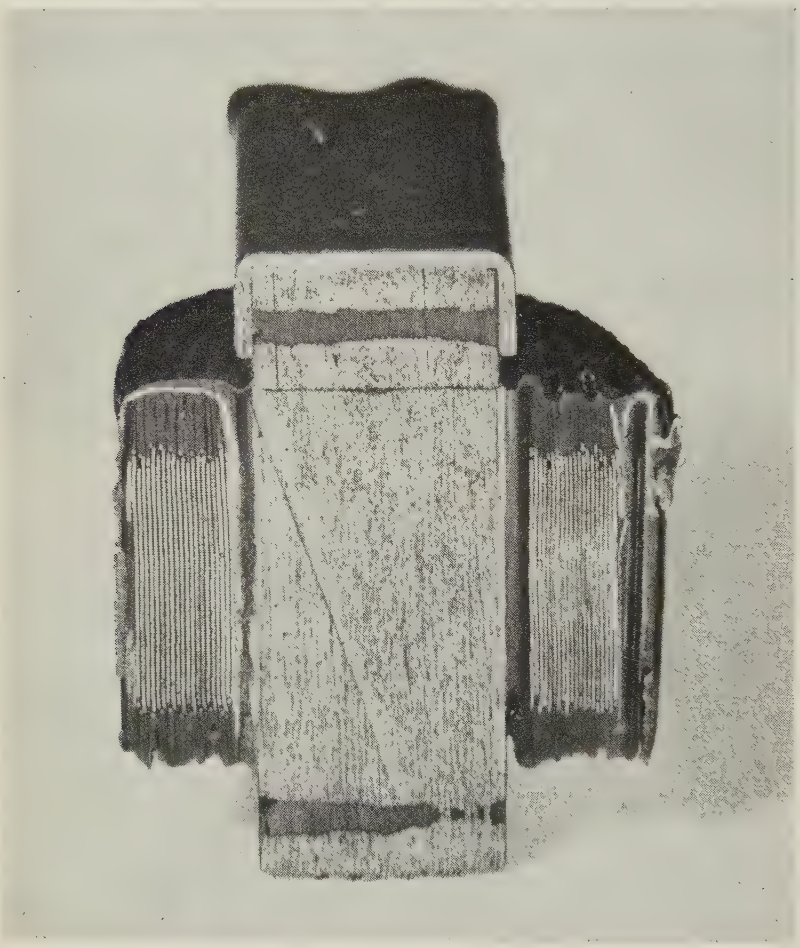


Figure 4, cutaway section of the impregnated and encapsulated choke.

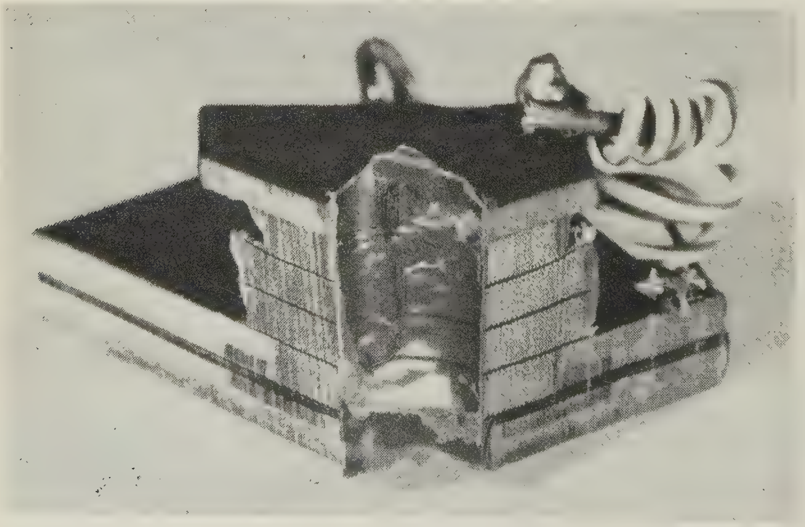


Figure 5, cutaway section of the impregnated and encapsulated high resolution transformer.

Table 1—Typical Measurements for Moisture Resistance

		Before Moisture	After Moistur and Overload
(1–2)	To Case	5.0×10^5	2.0×10^4
(3–4–5)	To Case	4.0×10^5	3.0×10^4
(1–2)	To Case (3–4–5)	4.0×10^5	2.0×10^4

Table 2—Test Results from Typical Samples

Three Coats of Resin		One Coat of Resin	
Before Moisture	After Moisture	Before Moisture	After Moisture
2.0 x 10^5 Megohms	2.0 x 10^4 Megohms	2.0 x 10^5 Megohms	6.0 x 10^2(1-2) Megohms
5.0 x 10^5 Megohms	3.0 x 10^4 Megohms	5.0 x 10^5 Megohms	6.0 x 10^2(3-4-5) Megohms
5.0 x 10^5 Megohms	2.0 x 10^4 Megohms	2.0 x 10^5 Megohms	4.5 x 10^1(1-2) Megohms

met by the cast epoxy, a group of step-down power transformers (see figure 1) were tested according to MIL-T-27A, class 5. The material met all the requirements, including dielectric strength, insulation resistance, thermal shock, moisture resistance, overload, flammability, and life. The thermal shock test consisted of cycling from 155°C to —55°C. Typical measurements for moisture resistance are given in table 1.

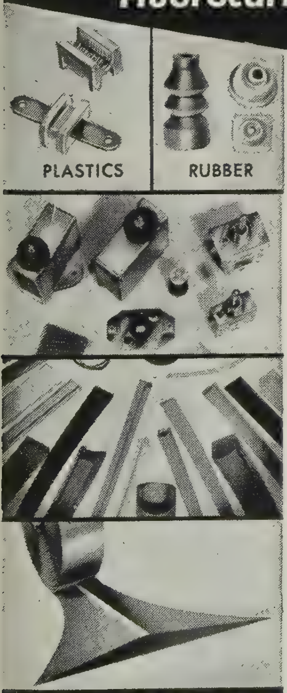
During the pilot runs, it was found that no design created major problems for the dip-impregnation technique. When casting a unit, design changes, terminal relocation, and other factors had to be taken into account.

Preliminary economic studies showed that dip-impregnation was a cheaper method than the other. During the experiments, questions were raised about the technique being successful for various sizes and designs of transformers. The resin used failed to meet thermal shock requirements when employed as a casting material. Extensive tests conducted with different designs proved that this resin met thermal shock requirements when used as a dip-impregnant on all configurations.

In addition to the above unit, a choke (figure 2) and a high resolution transformer (figure 3) were tested for thermal shock characteristics. The units were cycled from 180°C directly into a dry ice acetone at —80°C without failure for five cycles.

In the dip-impregnation it was at first thought desirable to use only a single impregnation, but experience proved that three dips are necessary for maximum environmental protection (see table 2).

Summing up the advantages for dip-impregnation, it was found that the units so protected gave better performances from an electrical standpoint, better heat conductivity, and a flexibility in holding dimensions to a minimum which was not possible before.



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European Insulation Report

Ed. Note: *The author of this monthly European report is a well-known insulation expert associated with a large European electrical manufacturer. Although it is necessary that his identity not be revealed at this time, correspondence may be exchanged with him by writing* European Editor, Insulation, Box 270, Libertyville, Illinois.

Aging and Dielectric Losses of Impregnating Agents for Condensers

By H. Elsner in Bulletin des schweizerischen elektrotechnischen Vereins, vol 51, Nr. 15, July 30, 1960, pp. 733-739. Original title: Alterung und Verluste von Imprägniermitteln für Kondensatoren. H. Elsner is director of the firm Condensateur Fribourg S.A., Switzerland.

There is, at present, an increasing demand for condensers to compensate the reactive power in high voltage nets.

Since the thirties there has been a tendency to replace transformer oil as an impregnating agent for paper condensers by agents like chlorinated naphthalene and especially by chlorinated diphenyls (trade names: "Pyranol," "Pyralene," "Aroclor," "Clophen," etc.). In spite of this, mineral oils still show themselves to be excellent for some specific purposes. A comparison between mineral oils and chlorinated diphenyls shows:

1) *Mineral oil.* Advantages: Stability of the capacitance and of the power factor (tan δ) over a temperature range of 60 to 80°C. Not susceptible to contamination. Good impregnability, small viscosity.

Disadvantages: Formation of x-wax during severe dielectric stressing; dielectric constant smaller than that of paper and therefore inhomogeneous dielectric; inflammable.

2) *Chlorinated diphenyl.* Advantages: Dielectric constant more or less same as for paper, i.e., good field distribution. Strong resistance to aging; no x-wax formation; higher ionization inception voltage; not inflammable.

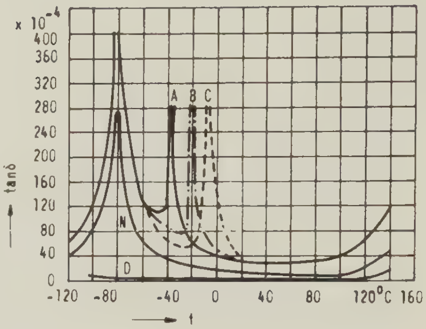

Figure 1, the influence of the temperature t on tan δ of impregnated paper. "A"—trichlorodiphenyl, "B" — tetrachlorodiphenyl, "C" — pentachlorodiphenyl, "D" — mineral oil, "N"—not impregnated.

Disadvantages: Change in viscosity, capacitance, and losses under 0°C. Very susceptible to contamination during manufacture and eventually to formation of harmful gases.

In contrast to transformers and also to cables, rapid aging results due to the highly stressed condenser dielectric. Small traces of chemical decomposition can result in a thermal breakdown.

Suitable test methods for testing the impregnating agents are being developed at present. Such short time tests naturally do not permit a correct evaluation with regard to the serviceability of the impregnating agent in the condenser. Thanks to the comparison tests with the impregnating agents where service experience already exists, the results are useful and give important information, which is not possible with a superficial examination (acidity, breakdown strength, tan δ).

The following tests are recommended:

a) Aging and oxidation (at 115°C during 7 to 28 days); tan δ at 500 volts 50 cps, and insulation resistance at 85 volts d-c serve as measures for aging.

b) Gas absorption or emission as a measure of resistance to ionization. This property is very important when discharges occur at overvoltages. Th test method according to Dussek i recommended.

c) Determination of the physical an chemical properties (interfacial tension test, rocking test, infrared spectrum test, ultra-violet absorption under a hydrogen atmosphere).

d) Model tests and ionization test The author attributes to these test the greatest importance for evaluating serviceability. He recommend condenser models 0.5 to 1 μF, 500 t 1000 volts, 50 cps. The models ar aged at different temperatures an voltages and the tan δ as well a the insulation resistance periodicall measured. Tests with voltages abov the inception voltage are also performed.

A comparison of the results wit mineral oils and chlorinated dipheny is hardly possible. For example, th latter has shown that there is no ga formation when corona takes place also, the corona inception stress lie higher, but in contrast is highly susceptible to contamination.

After making a few remarks abou impregnation, the author describe the usual control and type tests Though these are mostly short-tim tests, they give a good insight int the quality of the impregnation. (Endurance test: 48 to 72 hours with 1. times the service voltage. Stabilit test. Over-voltage tests: tan δ to b measured before and after tests wit impulse voltages.)

Investigation into contamination Despite the fact that the magnitud of the power factor (tan δ) is n measure for quality, some conclusion can be reached by comparing th measurements on different objects For example, if values for chlorinate diphenyls are measured as shown i figure 2, then the condenser is regarded as not serviceable.

To check the aging of condenser in service, tan δ can be measured o individual units as a spot-check. Fabr (France) has recently recommended

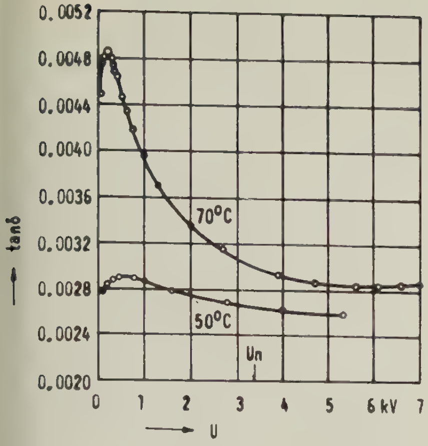

Figure 2, the influence of the voltage "U" on tan δ of condensers with contaminated chlorinated diphenyl. Un= nominal voltage.

a measurement of the absorption current with 200 to 400 volts.

Breakdown Voltage of Epoxy Resins In an Inhomogeneous Field

By M. Eberhardt in Elektrie, vol. 14, No. 2, Feb. 1960, pp. 57-60. Original title: Die Durchschlagsspannung von Epoxyharz im inhomogenen Feld. M. Eberhardt is at the Technical High School, Dresden, East Germany.

An investigation was carried out into the 50 cps breakdown voltage between point-plate electrodes of epoxy resin Epilox EG-1 (East German product) filled with quartz powder. The influence of the rate of voltage rise on the breakdown values for a thickness of 5 mm was very small. At 1 kv/10 minutes the decrease in breakdown strength was 7%. The test was performed with a 5 kv/sec rate of voltage rise. The values shown in figure 3 are the average from 6 to 8 measured values. The maximum deviation is ±14%.

The temperature in the range of 20°C-90°C had no influence on the breakdown voltage for a thickness of 3 mm.

Tests with different materials (thickness 200 mm) between point electrodes gave the following values: Breakdown value for epoxy (with 150% quartz), more than 240 kv; and for paper laminate impregnated with phenol and fabric laminate impregnated with phenol (in the direction of the laminations), 146 kv and 165 kv, respectively. Voltage endurance test with 150 kv for 75 hours—with epoxy there was no damage, with 100 kv with paper laminate there was a breakdown after 15 minutes, and with 60 kv with fabric laminate there was a breakdown after 20 minutes.

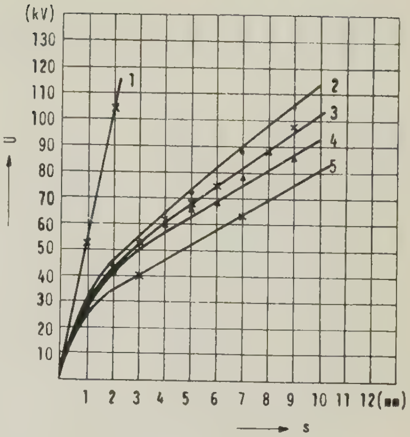

Figure 3, breakdown voltage "U" (minimum values) in function of thickness "s" for different quartz powder additions. 1) Sphere-Plate electrodes, 2-5) Point-Plate electrodes. Quartz powder addition: 1) 100%, 2) 200%, 3) 150%, 4) 100%, 5) 0%.

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Advances in Insulating Varnish Technology Eliminate All But "Good Housekeeping" For Varnish User

By David M. Kelly, Vice President, George C. Borthig Company Inc.

Fortunately for the manufacturer who uses insulating varnish, tremendous research has transformed the material into a stable and reliable component of the insulation system. A far cry from its ancestor of many years ago, the insulating varnish of today is available in a wide array of specific types for specific uses—and all of them can be counted on for durability in the tank and maximum performance efficiency.

This has come about through no accident. The use of highly refined scientific tools in the laboratories of most of the insulating varnish manufacturers has resulted in procedures and methods that take the guesswork out of insulating varnish selection. Previously, varnish users needed elaborate controls and checks to maintain varnish stability in the dip tank. Today, the lion's share of this work has been eliminated by special varnish formulations and advanced methods of laboratory and field testing.

Manufacturers' Contributions

Constant development of new testing equipment, as well as refinement of testing procedures, are the rules among insulating varnish manufacturers. These measures have carried the insulating varnish industry to a level compatible with the most precise standards expected in the electrical industry. Many tests, once looked upon as the responsibility of the user, are performed by the insulating varnish manufacturers.

Motorette tests, helical coil tests, and insulation resistance tests, to name a few, are carried out in advance by varnish companies in order to provide the electrical insulating varnish user with the utmost confidence in the materials he employs in his manufacturing process.

Beyond the countless laboratory tests, the varnish manufacturer's access to on-the-job performance records adds to his knowledge of the diverse characteristics of the various varnishes. Improved maintenance of such records by the varnish user has made them even more meaningful. These vital sources of information enable the varnish manufacturer to select the best possible product to suit the differing needs of users. This is the major reason why varnish users should turn their problems over to a reliable varnish manufacturing firm. Despite such compelling evidence, many electrical equipment manufacturers still engage in a kind of "seat-of-the-pants" varnish selection, based partially on grapevine hearsay, partially on their own highly limited experience (in comparison with the varnish manufacturer's experience), and partially on whim.

Good Housekeeping by Users

However, certain procedures must be followed by the insulating varnish user. And these may best be labelled "good housekeeping" procedures. Today, even with the fine varnishes obtainable, equally good equipment (ovens, dip tanks, etc.) is important. And to insure best results, cleanliness is a must in such areas as the dipping room.

An important factor in the application of insulating varnish is its viscosity which can vary as solvent evaporates from the tank or drum. Exposure to air is the cause of evaporation and obviously, the simplest precautionary measure is to keep the tank covered at all times when not in actual use. An interesting note is the fact that the ratio of surface to overall volume of varnish has an important bearing on the rate of solvent evaporation. For example, a one-foot deep tank that is two-feet square exposes more varnish to the air than one that is four-feet deep and one-foot square. And even where surface area is equal, evaporation from a deeper tank is proportionately less than from a more shallow tank. This is one reason why tanks should be maintained at as high a level as is practical.

Actually, in spite of all this talk of solvent evaporation, correction is a simple matter. It is the relation of the solids to the solvent on which correction hinges. The following uncomplicated but very effective technique of determining specific gravity via the hydrometer is recommended. This test will indicate to the user the amount of solvent evaporation and how much should be replaced.

Determining Specific Gravity

It is important to note that no more solvent should be replaced than was lost. The use of the hydrometer is based on the well-known principle that a floating body displaces a volume of liquid equal to its own weight. This results in a body displacing less of a heavy liquid than of a light one. For this reason, a hydrometer will not sink as deeply into a heavy liquid. Furthermore, since liquids are heavier when cold and lighter when hot, for purposes of uniformity and comparison, the standard temperature at which hydrometer readings are taken is 70°F. If such a temperature is not feasible, it is necessary to correct readings by adding 1° Baumé (the way in which specific gravity is usually expressed) for each 10° below

70°F and subtracting 1° Baumé for each 10° above 70°F.

The actual procedure of taking specific gravity is fairly simple. Immerse the hydrometer in the varnish until it floats free, being sure it does not dip down into the varnish lower than the point at which it floats. If the hydrometer reading shows the standard Baumé for the particular varnish, then no thinning is necessary. On the other hand, if the reading shows the varnish to be heavy, then it is necessary to add thinner, the proper percentage being determined by consulting a standard solvent chart. This chart lists "observed Baumé reading" and "desired Baumé reading."

A simple device for measuring both temperature and specific gravity at the same time, making it easier to make corrections, is the thermohydrometer, with an upper scale for measuring specific gravity and a thermometer for the lower scale.

The preceding method, incidentally, is a far cry from methods previously used. Before a simple specific gravity or viscosity test had been devised, insulating varnish users engaged in their own "seat-of-the-pants" technique. This involved adjusting the viscosity by "feel," which consisted of stirring the varnish or draining it from a stick.

Rules-of-Thumb

A few simple rules-of-thumb are well to remember, too. One is to keep the varnish clean . . . blow dirt and dust from units before immersion. Another is that thinner should be added slowly and thoroughly stirred into the varnish with moderate agitation. A third is that the thinner that is to be added should be at the same temperature (approximately) as the tank varnish, facilitating mixing.

All told, the good housekeeping procedures for varnish users are extremely few. The majority of the important tests have already been performed by the varnish manufacturer. For this reason it is essential that a reputable varnish firm should be consulted . . . one that is known to keep up with the latest techniques in insulating varnish laboratory procedures.

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Banding Armatures with Polyester-Glass Tape

By Alfred G. Moreton, Professional Engineer, Pittsburgh Electrical Insulation Co., Pittsburgh, Pa.

Polyester resin impregnated fiber glass tape for banding armatures may be applied by any standard type of winding machine or an engine lathe of suitable size. The machine should have a tailstock and tension device—many have been converted from those used with wire by replacing the sheaves with pulleys or rollers having a flat smooth surface.

A means of measuring the tension is an important part of this equipment. For best results, the tape should be applied at tensions approximately as shown in table 1.

Several companies manufacture a winding machine complete with banding and tension measuring unit, or the tension part can be purchased and added to winding machines not having one.

When threading the device with tape, a length sufficient to make about one and one half turns around the rotor is drawn through and wrapped on over the loose end of tape. Then after two or three turns are applied, the proper adjustment of tension is made. After the calculated number of turns have been applied, an additional two or three turns can be put on as a safety factor. The tape is then cut, and the end is passed under the preceding turn and smoothed over with a knife or spatula. The end also may be sealed with a hot soldering iron.

It is preferable to heat the rotors at temperatures varying from 100°C to 150°C depending upon size prior to the banding operation, after which they are removed to an oven for a baking cycle. This may or may not be done immediately after banding.

The minimum baking cycle generally is 3½ hours at 125°C; large rotors require 4 to 6 hours at 150°C.

Where the width of the band is not so important, the thickness may be tapered off at the edges to maintain density in these areas. When it is desirable to have greater thickness at the edge, as in the case of building it close to the commutator riser, a special glass tape having a cord along one edge may be used. The side with the cord is placed adjacent to the commutator and the banding tape is built up flush with the cord. Th
material is known as edging tape.

Table 1, Properties of a Polyester Resin-Fiber Glass Banding Tape With an Average Tensile Strength of 200,000 psi.

Width of Tape	Number of Glass Yarns	Recommended Tension For Applying	Tensile Strength When Applying	Tensile Strength After Cure
⅜″	30	225 lbs.	300 lbs.	550 lbs.
¾″	60	400 lbs.	600 lbs.	1100 lbs.
1″	80	500 lbs.	800 lbs.	1500 lbs.

Table 2, Properties of Steel Banding Wire with 200,000 psi.

Dia. Wire, inches	Area, sq. in.	Tensile Strength, lbs.	Weight per 1000 ft., lbs.
.054	.00229	458	7.70
.063	.00312	624	10.50
.072	.00407	814	13.7
.080	.00503	1000	16.9
.0915	.00605	1330	22.3
.105	.00806	1732	29.1
.120	.01131	2262	38.0

The method of calculating the si
of a band is similar to that used f
metal bands. However, many use
apply polyester-fiber glass bandi
tape according to their own idea
Some apply the same number of tur
of ¾″ width tape as there we
strands of wire in the band they
moved; others build them about t
same width as the old band and to
height just under the diameter of t
core. These are safe methods.

Wire and Tape Comparisons

Table 1 lists the recommended te
sion for applying three differe
widths of a banding tape consisti
of resin impregnated fiber glass yar
the tensile strength in pounds whe
applying, and the tensile strength
pounds after cure. The average te
sile strength in pounds per squa
inch of this tape is 200,000, the thic
ness is approximately .015″, and t
weight of one inch width tape is
yards per pound. The weight ma
vary slightly with the percent of resi

Table 2 shows the tensile strengt
in pounds and the weight per 10
feet of various diameters of a ste
banding wire with an average tensi
strength of 200,000 psi.

In comparing the two banding m
terials, it will be noted that one tu
of a ¾″ tape has a tensile streng
of 1,100 pounds. One turn of a .08
diameter wire has a tensile streng
of 1,000 pounds. A tensile of 50,0
pounds would be achieved with
turns of the .080″ wire, whereas on
46 turns of the ¾″ tape would be
quired to achieve the same tensi

Banding Calculations

The following data should be co
sidered for calculating a band:

W=Weight of coils to be su
ported. This usually includ
only the sections extending b
yond the core.

R =Radius in inches to center
gravity of the coil section.

N = Number of revolutions of rotor per minute.

f = Bursting force in pounds.

The formula for $f=\dfrac{W \times R \times N^2}{12 \times 2933 \times 2 \times \pi}$

As an example of use of the two materials in an actual banding job, consider the following data pertaining to a rotor known to have been in continuous service exposed to moisture and acid fumes, where W=69.4 lbs., R=7.05", and N=3600 rpm. The bursting force due to the weight of copper is then 28,700 pounds:

$$\left(f=\frac{69.4 \times 7.05 \times 3600 \times 3600}{12 \times 2933 \times 2 \times 3.1416}=28{,}700\right)$$

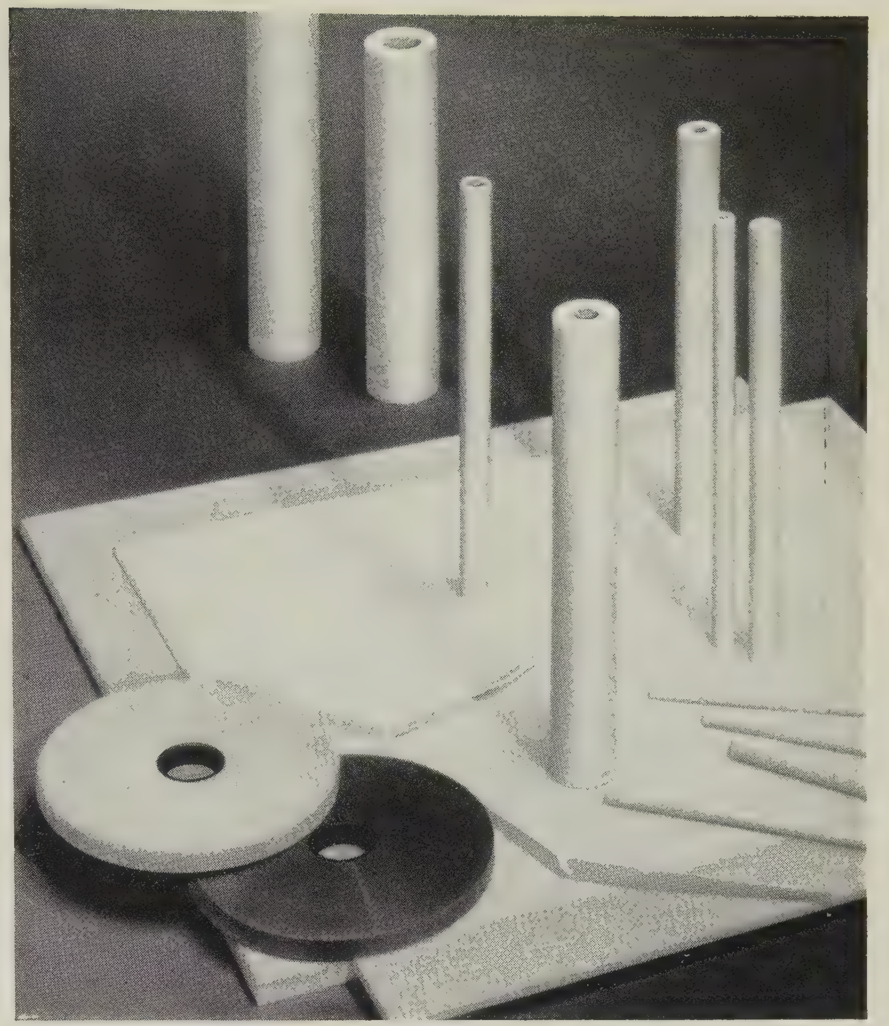
To this must be added 2,100 pounds (f for weight of insulation on coils, etc.) and 16,000 pounds (f for weight of the metal band wire). In this case, phosphor bronze banding wire was used because of the conditions under which this motor had to operate. The tensile strength of this wire was 120,000 psi, diameter was .102", area of wire was .00818 sq. in., and the weight of 324 turns was 34.58 lbs. Using 34.58 for W in the formula, the bursting weight due to the metal band wire is found to be 16,000 pounds. The total bursting force then is 46,800 pounds.

The tension in the band due to this total bursting pressure of 46,800 pounds is found to be 17,650 pounds

$$\left(\frac{46{,}800}{.00818 \times 324}\right)$$

The ultimate strength of 120,000 pounds divided by the tension gives a 6.4 factor of safety.

If the fiber glass banding tape were used on this job, it would be found that 120 turns of the ¾" width tape would weigh about 4 pounds. When substituted for the weight of the wire in the formula, this would reduce the 16,000 pounds bursting pressure of the banding to 1,800 pounds, and would reduce the total bursting pressure to 32,600 pounds. As the ¾" tape has a tensile of 1,100 pounds, 1,100 × 120 turns = 132,000 pounds total. Again, dividing the ultimate strength (132,000 pounds) by the total bursting pressure (32,600 pounds) the factor of safety is found to be 4. For most applications, a factor of safety between 3 and 5 is considered very satisfactory.



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R/M has from the beginning offered "Teflon" in the widest range of forms and sizes — rods, sheets, tubes, tape, a variety of machined parts; and R/M was among the first to offer etched "Teflon" for bonding. No doubt about it — from R/M you get the advantage of a *complete "Teflon" service.*

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Association News

Flowers Reappointed Chairman Of AIEE Electronics Committee

Harold L. Flowers, director of Weapons Systems and the Forward Project Planning Division at Goodyear Aircraft Corp., has been reappointed chairman of the American Institute of Electrical Engineers' Electronics Committee.

The committee consists of 13 separate technical committees representing all major electronics fields. It plans, arranges, and conducts national meetings, prepares technical papers, and draws AIEE membership attention to new engineering applications involving electronics.

Electronics Conference Will Feature Semi-Conductors

The theme of the Mid-America Electronics Conference (MAECON) which will be held at the Hotel Muehlebach, Kansas City, Mo., on November 15-16, is "The Semi-Conductor 60's." The conference is sponsored by the Kansas City Section of The Institute of Radio Engineers, Inc. with the assistance of the Kansas City Section of the AIEE and the Lincoln-Omaha, St. Louis, and Wichita sections of the IRE.

Some 20 technical papers will be presented on semi-conductors. In addition, 16 papers will be given in microwave and engineering education and management sessions.

Dr. William Shockley, co-inventor of the transistor, will be the featured speaker at the annual banquet. The annual Kansas City IRE Section Award will be presented to Dr. Charles N. Kimball.

Other features of the conference include a social program for the ladies and exhibits of electronic and electrical products. Exhibits are being handled through the Heart of America Chapter of the Electronic Representatives Association, Industrial Div.

Request Papers for IRE Winter Convention on Military Electronics

The Winter Convention on Military Electronics, sponsored by the Institute of Radio Engineers Professional Group on Military Electronics, will be held on February 1-3, in Los Angeles. Technical papers on the following fields of interest are being solicited: Reconnaissance, surveillance, ranging and tracking, communications, navigation, telemetry, data handling and display, electronic warfare, fire control and fusing, electronic propulsion, power sources, instrumentation, satellite systems and subsystems, inertial systems, system reliability, re-entry, military implications of space age, and components.

A series of classified sessions under the sponsorship of the Military are planned. For these sessions, each author will be responsible for obtaining the proper clearance for his paper, which must be limited to confidential.

All material to be considered for presentation must be in the form of 100 word abstracts and 500 word summaries. Material must reach the Technical Program Committee by Nov. 15. Please send all papers and correspondence to: Dr. John J. Meyers, Hoffman Electronics Corp., Military Products Div., 3717 S. Grand Ave., Los Angeles 7.

Baechle Joins NISA Engineering Staff

August A. Baechle has been appointed a staff engineer of the National Industrial Service Association, Inc.

Baechle, 29, has been employed as an application engineer by the Allis-Chalmers Mfg. Co., Norwood, Ohio. NISA, which will be renamed "Electrical Apparatus Service Association, Inc." in April 1961, now has three staff engineers.

San Francisco Section of IRE Forms PG on Instrumentation

A Professional Group on Instrumentation was recently formed by the San Francisco Section of the Institute of Radio Engineers, Inc. A very interesting technical program has been planned for the remainder of 1960 and for 1961.

Officers of the new group are Chairman — Dr. Nicholas Pappa Iconix, Palo Alto; Vice Chairman— H. A. Kazanjian, Peninsula Ass ciates, Redwood City; Secretary— Leslie G. Burlingame, Lenkurt Ele tric Co., San Carlos; and Treasurer— James G. Hussey, General Radio Co Los Altos.

Western Appliance Conference Meet In Los Angeles, November 7

The second Western Applian Technical Conference, sponsored b the Los Angeles section of the Amer can Institute of Electrical Engineer will be held at the Biltmore Hotel, Lo Angeles, on November 7.

This conference will be of value t those associated with electrically con trolled equipment and/or applianc for the home. It will deal with appl ances of both electric and gas desig

All interested engineering, sale and management people are invite to attend. Close association with th electrical industry or membership i the AIEE is not required.

Subjects will be presented b equipment manufacturers, compone suppliers, public utilities (both g and electric), and private organiz tions devoted to safety.

Papers concerning design applic tion, codes, and standards will b presented in the morning and afte noon sessions.

For the evening session there wi be a seminar on the application electrical components on gas appl ances.

Annual Astronautical Meeting In Dallas, January 16-18

The seventh annual meeting of th American Astronautical Society, e pected to attract hundreds of spa scientists and engineers from throug out the United States, will be he January 16-18 at the Sheraton-Dall hotel, Dallas, Texas. James R. Roac Vought Astronautics, is gener chairman.

Included in the technical progra will be sessions on astrodynamics, co

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POWER CABLE ISULATED WITH MONSANTO POLYETHYLENE

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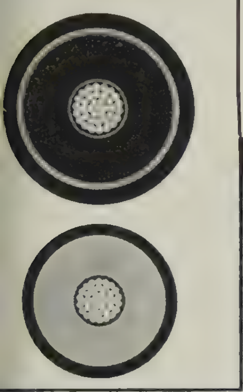
Leading manufacturers now produce power cable insulated with polyethylene based on Monsanto Polyethylene resins, specially developed and perfected by Monsanto. For complete technical data including applicator's information, write to Monsanto Chemical Company, Plastics Division, Room 730, Springfield 2, Massachusetts.

MONSANTO ACTIVATOR IN **PLASTICS**

e the slim shape and size of polyethylene-insulated cable er), compared to the old e (upper) being replaced.



New 15,000 volt polyethylene-insulated power cable installation at main sub-station, Monsanto Chemical Co., Plastics Division plant, Springfield, Mass. Installation-rated at 175 amps, 15,000 volts. 3-phase system, 1 conductor per phase. Conductors are 2 0-37 strand copper (133,100 circular mils). Insulation consists of: 1 layer semi-conducting tape, 297 mil polyethylene insulation, 1 layer non-metallic tape, metal shielding, 1 layer tape, 6/64″ vinyl jacketing.

mology, solar systems physics, geophysical exploration, lunar and planetary exploration, space systems applications, space communications, navigation and guidance, bio-astronautics, re-entry and recovery, and social and political aspects of space programs.

New Pacific Electronic Trade Show

Devoted to the western marketing needs of the electronic components industry, a new Pacific Electronic Trade Show is to be sponsored and produced annually by the western distributor segment of the industry. Its location will rotate among major cities throughout the West.

The first show, scheduled for February 26—March 1, 1961, at the Great Western Exhibit Center, Los Angeles, is expected to draw an attendance of about 35,000 from western dealer-service establishments, distributors, engineers, broadcast trades, electronic maintenance, engineering, research & development and production users, defense and government buyers, trade schools, amateur radio operators, and other users.

Exhibits will cover the entire field of electronic components and services; however, exhibitors will be limited to those manufacturers who sell and promote their electronic products through distributor channels.

Further information may be obtained by writing to the Pacific Electronic Trade Show, 2216 S. Hill St., Los Angeles.

Epoxies, Other Insulating Topics In May Electrochemical Program

A complete electric insulation program will be presented at the meeting of the Electrochemical Society on April 20-May 4 in the Claypool Hotel, Indianapolis, Ind. The first day, May 1, will be devoted to papers on "The Mechanical and Electrical Properties of Epoxy Resins."

Three half-day sessions on capacitors are being planned to deal with problems associated with plastic film capacitors and electrolytic capacitors. In addition, it is expected that three half-day sessions will be devoted to general papers on such topics as dielectric breakdown, insulating liquids, ceramics, molecular interactions, and specialty papers.

L. J. Frisco, Johns Hopkins University, will preside over the epoxy resin session. Papers scheduled tentatively include: The Present Status of Epoxy Resins, by William S. Port, U. S. Dept. of Agriculture; A Flame Retardant Epoxy Resin, by R. A. Cass, Monsanto Chemical Co.; The Strength Retentivity of Cured Epoxy Systems in Mineral Acids, by John Delmonte, Furane Plastics Inc.; Effect of Elevated Temperature on the Physical and Electrical Properties of Epoxy Resin Bonded Glass Fabric Base Laminates, by A. H. Haroldson, Continental Diamond Fibre Corp.; The Mechanical and Electrical Properties of Epoxy Resins, by R. W. Warfield, U. S. Naval Ordnance Laboratory; Comparative Rheological and Fracture Properties of Epoxy Resins in the Glass Transition Range, by D. H. Kaelble, Minnesota Mining and Manufacturing Co.; The Mechanical and Electrical Properties of Oxiron Resins, by C. W. Johnston and M. H. Reich, Food Machinery and Chemical Corp.; and The Mechanical and Electrical Properties of New UCPC Epoxy Systems, by F. L. Williamson, Union Carbide Plastics Co.

Reliability and Quality Control Symposium to be Held Jan. 9-11

The seventh National Symposium on Reliability and Quality Control will be held at the Bellevue-Strafford Hotel, Philadelphia, on January 9-11. It is sponsored by the Institute of Radio Engineers, American Institute of Electrical Engineers, American Society for Quality Control, and the Electronic Industries Association.

Elect New WESCON Directors

New directors of the Western Electronic Show and Convention (WESCON)), are S. H. Bellue, president of the Western Electronic Manufacturers Association and vice president of Osborne Electronics Corp., and Edward C. Bertolet, vice president of Behlman Engineering Co.

They were elected to replace Walter E. Peterson, president of Micro Gee Products, and Hugh P. Moore, chairman of the board of Lerco Electronics Inc., who complete their four-year terms in November.

Bellue will be one of four directo representing WEMA on the boar and Bertolet will be one of four repr senting the Los Angeles and Sa Francisco sections of the Institute Radio Engineers.

Industrial Standardization Seminar

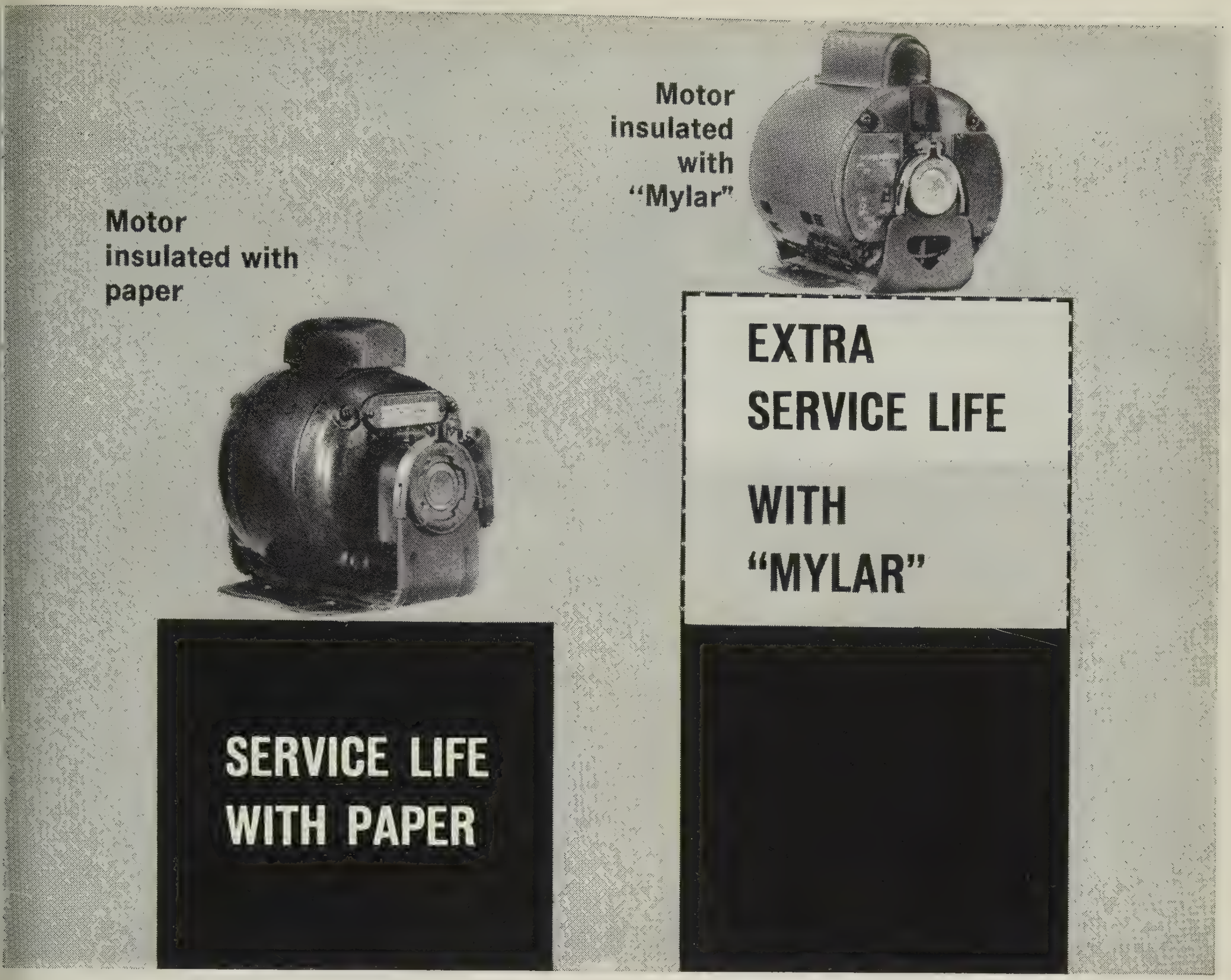
Dr. John Gaillard, consultant industrial standardization, will ho his next seminar on January 23- in the Engineering Societies Buildin New York City. His seminars are i tended to assist top management establishing the most effective admi istrative setup, procedure, and pr gram for handling standardizatic work, and in training staff men the functions of the standards eng neer, including the art of writir specifications. Attention is given standardization at all industrial level from the operating unit in a compa to international unification of sta ards. A full day will be reserved f round-table discussion of problems special interest to the compani represented.

For details and registration, wri to Dr. John Gaillard, 135 Old Pa sade Rd., Fort Lee, N. J.

Sheppard Named AIEE Vice Presiden

Howard H. Sheppard, vice pres dent, Utilities and Power Dept., Rur sey Electric Co., Philadelphia, h been elected vice president of th American Institute of Electrical Eng neers to represent the Middle Easter District. He will fill the unexpire term of D. L. Greene, Gilbert Ass ciates, who has moved to Okinawa an assignment that is expected to kee him away for about a year.

Confoosin' as it may seem to ol' Orville, there is a way to make Haadknose Byer sign that order. See how it's done at the Insulation Conference Marketing Meeting in Chicago, Dec. 8.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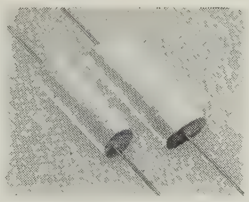
"Mylar" also cuts current leakage and shock hazard to a minimum because its insulation resistance is unaffected by moisture.

All these benefits can be packed into motors that are smaller . . . lighter. Reason: "Mylar" can be used in thinner gauges, and its thermal stability allows motors to run hotter and develop more horsepower from a given frame size. And yet, motors insulated with "Mylar" polyester film frequently cost no more than those using other common types of insulation.

Whether you manufacture or buy electrical products, you can get improved performance with Du Pont "Mylar". Figured on a square-foot basis, "Mylar" will often cost you less than your present material. For full facts on "Mylar", write for free booklet. E. I. du Pont de Nemours & Co. (Inc.), Room #14, Film Department, Wilmington 98, Delaware.

This unique combination of properties gives "Mylar" superior insulating performance.

- Average 4,000 volts per mil dielectric strength (ASTM D-149). Average power factor of 0.002 at 60 cycles.
- Thermal stability from -60°C. to Class B range.
- Chemical and moisture resistance.
- Resistance to aging, abrasion, tearing and rotting.



IN CAPACITORS—Units insulated with "Mylar" have superior moisture resistance and longer life . . . meet highest reliability standards.

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HOW TO PACK A LOT OF INSULATION IN A SMALL SPACE

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has high dielectric strength—400 volts per mil minimum—and close control of caliper and finish allows you to pack a lot of dependable insulation into your layer-wound coils, transformers and other components even though space requirements are tight.

Electronic Glassine is clean, chemically neutral and without holes, spots, conducting particles or tear-outs. It also meets the toughest requirements for non-insulating uses, too . . . mold release in coil insulating processes, mandrel cover for tube winding and protective sheeting during varnishing or grinding.

Electronic Glassine is available in both sheets or rolls; six thicknesses from .00075 to 0.0030 in. Write for samples and the Riegel Electrical Data Folder. Riegel Paper Corporation, P.O. Box 250, N. Y. 16, N. Y.

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Pixilated Patents

By Mike Rivise

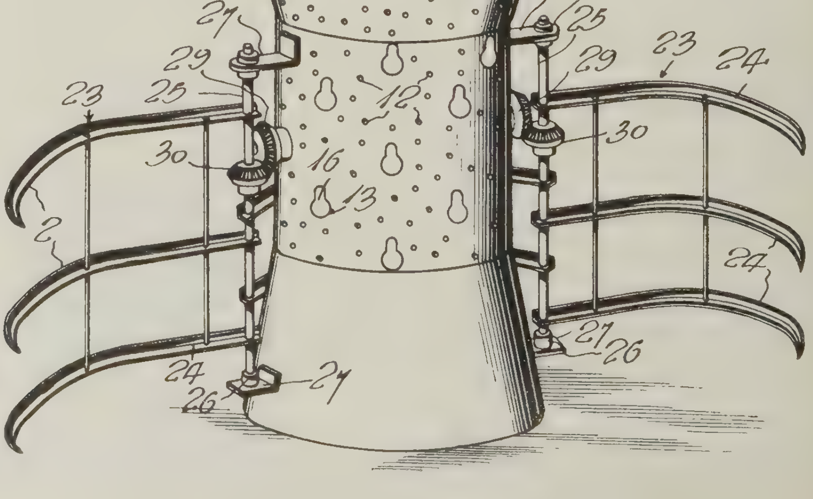
(Forty-seventh in a series of odd and interesting inventions in the electri-onics field from the files of the U. S. Patent Office.)

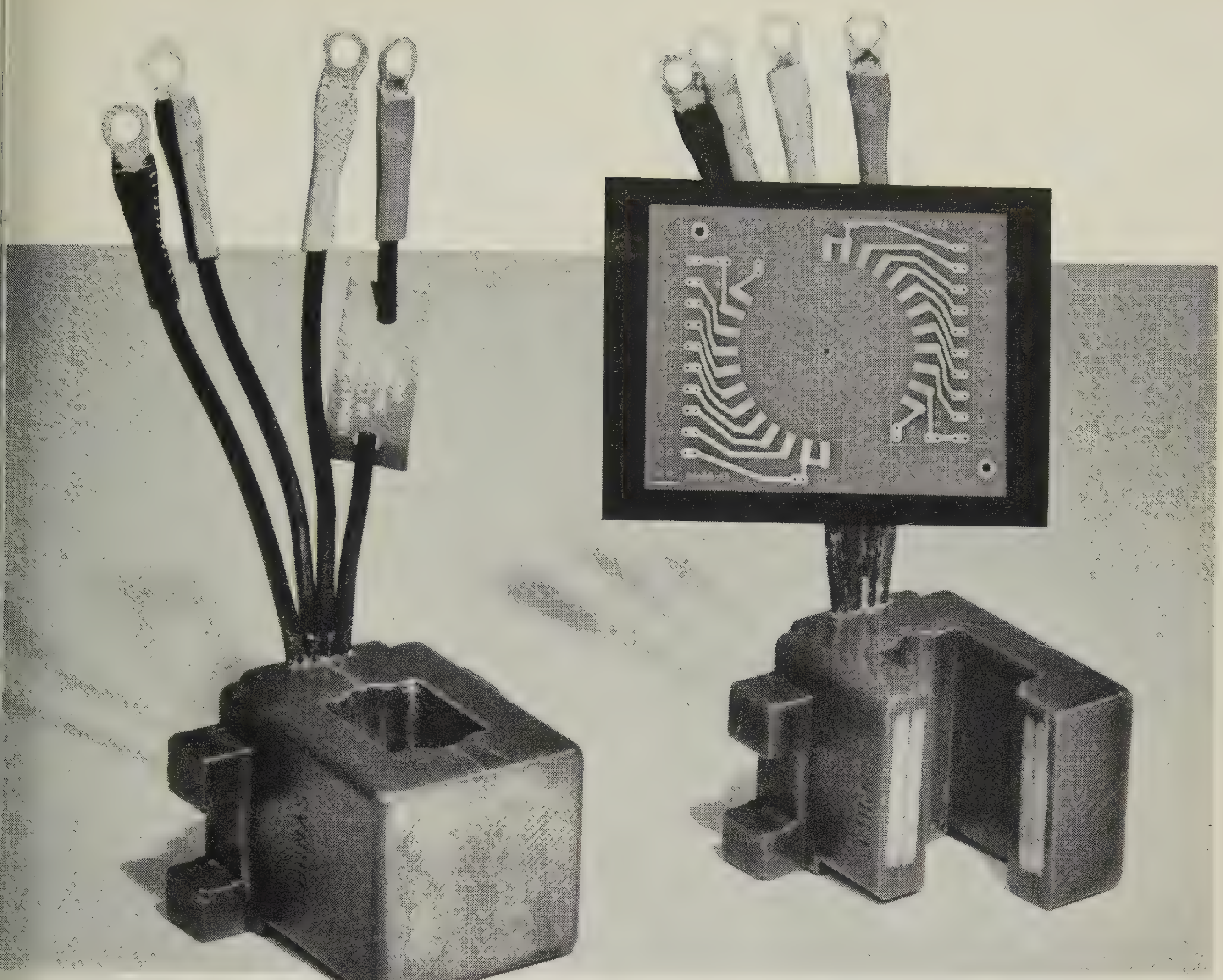
The peculiar looking device shown in the illustration is not a new-fangled lemon squeezer nor a pea baler, but simply a man catching tank for detaining bashful bank burglars until help arrives. A sheet-metal tank set on a motorized truck, it is designed to give watchmen both protection and mobility. In addition, the metal arms extending from the sides of the tank can be operated from the inside to close on and hold persons within their reach.

The patent also provides for a signalling device leading from the tank to some other point of assistance such as a police station. Of course, the watchman must signal for help before he goes after the burglar as a detachable plug for the alarm is pulled out as soon as the tank begins the chase.

No details on speed, maneuverability, type of motor, etc., are given, so it is hard to judge the effectiveness
this equipment. One can imagi
however, the reaction of a burg
who looked up from stuffing his sa
with money to see this contrapti
bearing down on him, steel arms wa
ing and clanking. Should the burg
recover sufficiently to put up a fig
the watchman can shoot him throu
one of the numerous gun ports in
cated in the illustration by the k
hole shapes. These gun openings a
normally closed from the inside
doors which operate on coiled sprin
The numerous small circles show
the illustration are peepholes for t
operator.

There are two doors to the tan
One (8) is closed and locked by
simple latch mechanism so that
may be quickly locked in case
tank is entered in a hurry. The ot
door (10) is controlled by a key a
may be used in instances where t
occupant of the tank cannot open t
door (8) from the inside for any re
son . . . such as having been shot
the burglar through one of the pee
holes.





Coils made by Deluxe Coil, Wabash, Indiana. Copper clad laminate made by Synthane Corporation, Oaks, Penna.

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BAKELITE Brand epoxies have already been proved in many applications. In laminated backings for printed circuits, they combine with glass fiber to give high physical strength along with exceptional resistance to heat, moisture, flame, and chemicals. For encapsulating, the additional advantages of high impact strength, dimensional stability, and excellent dielectric properties have solved many technical problems. Furthermore, epoxies do not shrink during cure—they protect better!

Newer developments—such as in nuclear energy and radiation, missiles and rockets, and underwater exploitation—are creating more demands for superior insulation with the unique combination of properties afforded only by epoxies. If you are stymied by an insulating problem still on your drawing board, let Union Carbide Plastics Company help you find the appropriate solution before it becomes a production handicap. Write Dept. EX-75, Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Toronto 12.

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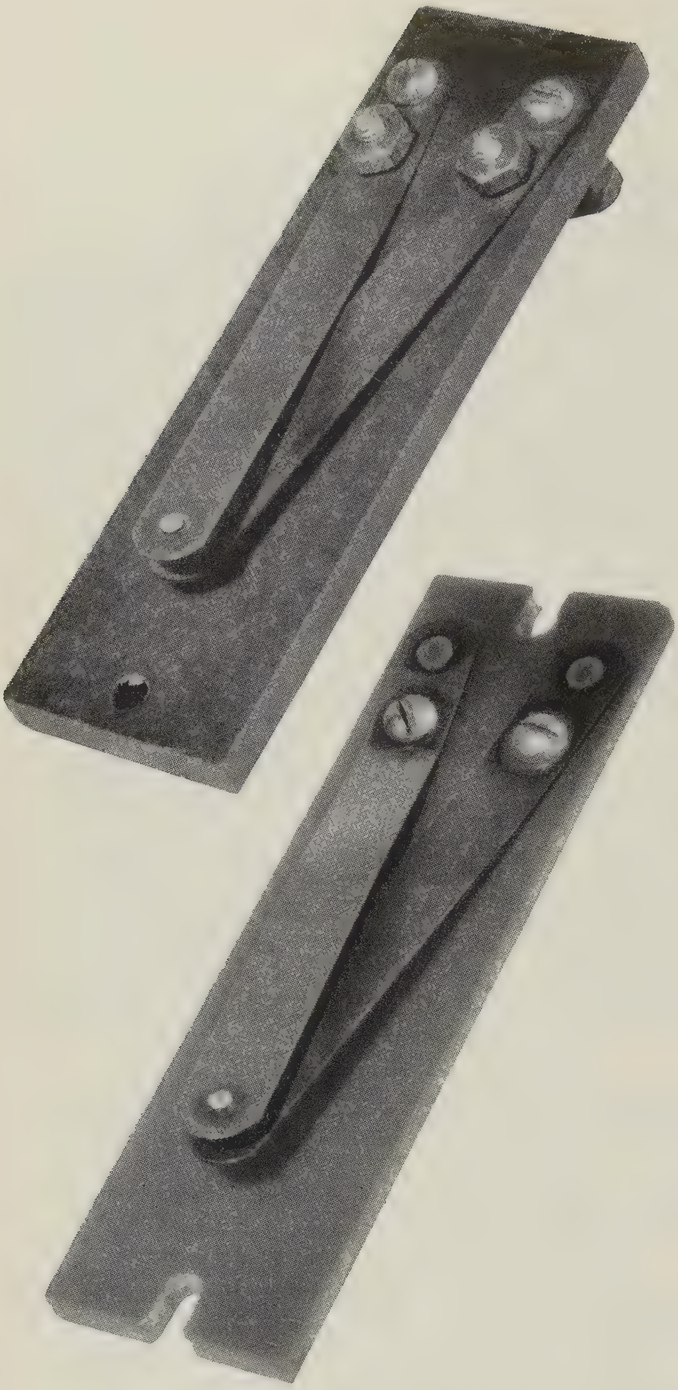

HOW TO PUNCH HOLES IN HIGH PRODUCTION COSTS...

The original production of this switch base (left top) called for sawing on 4 sides, drilling 7 holes and affixing 4 screws and nuts. Spaulding reduced these operations at a saving of 75% by re-designing the part (left bottom) and using a grade of Spauldite that can be punched and extruded.

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Officials Invite Insulation Users, Producers To "Best Ever" Application Conference, Dec. 5-8

Conference officials and committee workers have extended a cordial invitation to all electrical/electronic insulation users and producers to attend the Third Annual Conference on the Application of Electrical Insulation at the Conrad Hilton Hotel in Chicago, December 5-8, 1960. General conference chairman William Hoffer of Johns-Manville Sales Corp. reports that an outstanding technical program, top-calibre commercial exhibits, high interest plant tours, the unusual Golden Omega Award presentation, the significant Unity of Action Banquet, and other events, as well as Chicago's famed hospitality, should make this the best insulation application conference yet held.

The two vice chairmen, Michael Nakonechny, Dow Corning Corp., and Roger White, The Glastic Corp., point out that this year's meeting should surpass last year's record-breaking conference because of the increased value and strengthening of all functions. The conference is open to everyone with an interest in insulation—designers, engineers, scientists, production men, purchasing agents, students, educators, management men, etc.

Technical Sessions

A total of 15 technical sessions with three to five papers in each session are scheduled for Monday, Tuesday, and Wednesday, Dec. 5-7. The program has been developed by program chairman Thomas Hart, Silicones Div., Union Carbide Corp. Titles of the 15 sessions are: Class F Systems for Medium Size Rotating Equipment; Progress in Switchgear Insulation; Electrical Circuit Connectors; Medium D-C Rotating Equipment; Materials for Upgrading Temperature for Controls; Guideposts in the Application of Electrical Insulation; Large Motors and Generators; Application and Evaluation of Transformer Insulating Materials; Thermal Endurance of Electrical Insulation; Repair and Maintenance of Rotating Equipment; Electrical Insulation Evaluation; Printed Wiring Assemblies; Foreign Electrical Insulation Practices; Molecular Key to Electrical Insulation Properties; and Missiles and Guidance Systems.

Plant Tours

Under the chairmanship of Donald W. Stewart, National Vulcanized Fibre Co., an interesting and varied series of plant tours have been arranged. In many cases, these tours present a once-in-a-lifetime opportunity to look on as electrical/electronic equipment is manufactured and to see insulation materials in use. On Monday, Dec. 5 at 1:00 pm., two tours are scheduled. One is for the Hawthorne Works of Western Electric Co. where visitors will see the rod and wire mill and cable plant. The second tour will cover the Electro-Motive Division of General Motors Corp. where diesel-electric locomotives and mobile generating units and controls are manufactured. On Wednesday, Dec. 7, a tour leaves at 8:30 am for Wisconsin, the home of Allis-Chalmers Mfg. Co. Visitors will see the manufacture of electric generation and distribution equipment. On Wednesday afternoon at 1:00 o'clock a tour of Motorola Inc. is scheduled. Guests will have the opportunity to see the production of television, radio, and communication systems. The Allis-Chalmers tour will cost $6.00 while all the others will be priced at $3.00. This will cover the cost of the chartered buses.

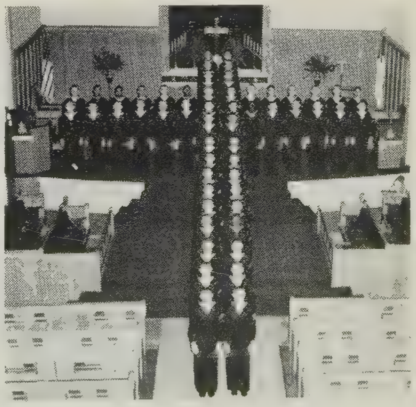
Commercial Exhibitors

At the time of this writing, nearly all available exhibit space had been sold. More than ever before, exhibitors realize the importance of staffing their booths with experienced engineers so that questions can be answered and problems solved on the spot in many cases. Exhibitors who have contracted for space since the last listing in *Insulation* include Chicago Printed String Co., Battelle Memorial Institute, Dodge Fibers Corp., Coast Manufacturing and Supply Co., and Pittsburgh Plate Glass Co.

Banquet and Award

Tickets at $15.00 each are now being sold for the Unity of Action Banquet which will be held in the Grand Ballroom of the Conrad Hilton on Tuesday evening, Dec. 6. One of the country's leading industrialists . . . an important figure on the national scene . . . will give the main speech. Toastmaster will be C. B. Burnett, president, Johns-Manville Corp. The banquet will also be the occasion for the presentation of the Golden Omega Award to a noted man responsible for significant technological achievements of world-wide importance. The recipient can't be revealed at this time. Last year's award went to Admiral Hyman Rickover, USN. Walter Hugger, Sun Chemical Corp., is in charge of the banquet. He is being assisted by Harry Chapman, Owens-Corning Fiberglas Corp., and John E. Byrne, J. J. Glenn and Co., 605 W. Washington Blvd., Chicago 6, Ill. (ticket sales).

Guests at the banquet will see and hear the Marine color guard, Naval Training Center Band, and world-famed Bluejacket Choir from Great



Lakes, Ill. Music will also be provided by the 15-piece Norm Krone orchestra.

Other Events

On Wednesday, Dec. 7, one of the sponsors of the conference, the American Institute of Electrical Engineers, has arranged a luncheon which will extend into a complete afternoon session devoted to foreign insulation practices. Dr. Richard Vieweg of Germany will speak at the luncheon on European Technology and Trends in Insulation. Other speakers and their subjects include: Dr. Hans Mosimann, Switzerland, Insulating Systems Used in Europe, Based on Mica Paper and Thermosetting Resins; Karl Kiesewetter, Germany, Testing Practices and Methods in Europe; Claes Tengstrand and A. R. Anderson, Sweden, Insulation Systems in Large Generators in Sweden; and Dr. Arnold Wichmann, Germany, Evaluation and Maintenance Testing of Generator Stator Insulation. Price of the AIEE luncheon is $5.00.

On Wednesday evening, the insulation materials division of the National Electrical Manufacturers Association, the other sponsor, is sponsoring an Insulation Progress Dinner which will be open to all manufacturers of insulating materials. Major M. E. Griffith, chief of test operations for the U. S. Air Force Ballistic Missile Div., Cape Canaveral, Fla., will speak on The Applications of Electrical and Electronic Equipment in Missile Launching. Exhibits describing the purposes and activities of NEMA will be on view and Eugene R. Perry, president, National Vulcanized Fibre Co., will preside. The charge will be $10.00.

Marketing Program

On Thursday morning, Dec. 8, a special marketing program will be presented for everyone concerned with the manufacture, sale, distribution, or purchase of insulation materials. Under the direction of E. J. Phelan, Prehler Electrical Insulation Co., the session will include papers on introducing new products, making insulation market research analyses, and customer treatment of salesmen, all by authorities in the field. special skit, both amusing and educ tional, will also be presented on ho .not to sell insulation. This progra will be followed by a luncheon which Bill Gove, noted sales co sultant and inspirational lecture will speak.

Special Issue of Insulation

The December issue of *Insulati* will be a special conference iss which will also include a world-wi insulation report, a unique editori feature of high interest. Full detai on the conference including the co plete program and all other inform tion will be covered in the Decemb issue. Extra copies will be distribut without charge to registrants at t conference.

Registration Card

A handy advance registration ca is included on page 52. Just fill the card and mail it now to avo long registration lines at the co ference—if you register now, yo complete registration kit will be wai ing for you when you arrive.

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OCCUPATION X ONLY ONE

- ☐ 01 ENGR.—SCIENTIST
- ☐ 02 ENGR.—DESIGN
- ☐ 03 ENGR.—APPLICATION
- ☐ 04 PRODUCTION
- ☐ 05 SALES
- ☐ 06 PURCHASING
- ☐ 07 MANAGEMENT (IF NOT ONE OF ABOVE)
- ☐ 08 TEACHER—STUDENT
- ☐ 09 ADV.—PUBLIC RELATIONS
- ☐ 10 OTHER ____

BUSINESS OR ORGANIZATION X ONLY ONE

- ☐ 01 MFR. OF INSULATING MATL'S
- ☐ 02 MFR. OF ELECTRONIC CONTROLS AND EQUIPMENT
- ☐ 03 MFR. OF GENERATORS, MOTORS AND CONTROLS
- ☐ 04 MFR. OF TRANSFORMERS AND SWITCH GEAR
- ☐ 05 MFR. OF TRANSPORTATION—LAND, SEA, AIR
- ☐ 06 MFR. OF INSULATED WIRE AND CABLE
- ☐ 07 SERVICE—MAINTENANCE—REPAIR
- ☐ 08 MFR. AGENT—DISTRIBUTOR—JOBBER
- ☐ 09 GOVERNMENT
- ☐ 10 OTHER (SPECIFY) ____

MEMBERSHIP X BELOW

- ☐ 01 AIEE
- ☐ 02 NEMA
- ☐ 03 ASTM
- ☐ 04 EASA (NISA)
- ☐ 05 SPE
- ☐ 06 SPI
- ☐ 07 IRE
- ☐ 08 NRC
- ☐ 09 WIRE ASSN.
- ☐ 10 NONE OF ABOVE
- ☐ 11 X IF ALSO BOOTH ATTENDENT

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☐ AIEE Lunch—Wed., Dec. 7	$ 5.00	____
☐ NEMA Dinner—Wed., Dec. 7	$ 10.00	____
☐ Marketers Lunch—Thurs., Dec. 8	$ 5.00	____

Check Schedule me for the following industrial tours:

☐ Western Electric Co., Chicago Mon., Dec. 5, Afternoon (U. S. Citizens Only)	$3.00	____
☐ Electro-Motive Div. (GMC), LaGrange—Mon., Dec. 5, Aftern'n	$3.00	____
☐ Allis Chalmers Co., West Allis, Wis.—Wed., Dec. 7, All Day	$6.00	____
☐ Motorola Co., Chicago—Wed., Dec. 7, Afternoon	$3.00	____

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Insulation Tests

Polytetrafluoroethylene Electrical Tubing

These articles by H. K. Graves, Supervisor, Electrical Insulation Section, Materials Laboratory, New York Naval Shipyard, are designed to explain the purpose, reasons, operation, meaning, and interpretation of results, etc., behind various tests for electrical insulation. Mr. Graves is also immediate past-chairman of Committee D-9 on Electrical Insulation Materials of the American Society for Testing Materials.

Polytetrafluoroethylene tubing is being used in an increasing number of applications, mainly in the smaller sizes. It is desirable not only for its resistance to high temperature, but also for its resistance to attack by hydraulic fluids. This latter characteristic makes it specially suited for missile applications.

In writing methods of test for this material in ASTM, it was possible to draw heavily on methods used for vinyl tubing. Since both manufacturers and users of this tubing are frequently the same as those concerned with vinyl tubing, an effort was made in the interest of standardization to use the same methods and equipment when this could be done.

Although not complete and of course subject to revision, ASTM Designation D1675-59T, "Tentative Methods of Testing Electrical Grade Polytetrafluoroethylene Tubing," has been published. At the same time, development work is continuing. For example, methods to determine concentricity are important on this product because of the way in which it is extruded and because of the pressures involved. Apparently, careful setting and adjusting at the start of the run does not mean that any given length of the run will be concentric. Another problem which does not appear at all with vinyl tubing is sintering after extrusion. Proper sintering is extremely important in the end product since either under or over sintering will seriously affect characteristics, and as in most products, time and money-saving production short cuts are continuously sought and tried.

To control inside diameter of the tubing, the method specifies minimum and maximum gauge rods. A little more care is required than for some other materials whose surfaces are less slippery.

To measure wall thickness, a micrometer equipped with a 0.020-inch hardened steel rod to support the tubing is used for sizes #22 and larger. The presser foot has a chisel edge of specified flatness and dimensions. The tubing is rotated on the rod anvil and maximum and minimum wall thickness of the ½-inch long specimens are recorded. Unfortunately, these are averaged in the report so that no indication of concentricity appears in the report. Since the method covers tubing down to and including #30, and since concentricity becomes more critical on the smaller sizes, a method of measuring wall thickness is included for Nos. 24 to 30. This is described as an optical method such as a toolmaker's microscope. Thicknesses as low, perhaps, as 0.004-inch are being measured here. This can be done with good accuracy on the toolmaker's microscope. The reluctance to specify this instrument exclusively is probably one of instrument cost, but "using other optical means" does not help much in standardizing a method.

A method for volatile loss by weight after exposure to 300°C for two hours is included and is intended to indicate the efficiency of volatile removal during processing and the presence of undesirable organic materials.

The conventional penetration test, using a 1/16-inch steel ball as a penetrator, a 1000-gram weight, and a constant rate of rising temperature to failure, gives a measure of resistance to cut-through where an area of localized high pressure may exist.

Dielectric breakdown uses a 1-inch strip of foil as an outer electrode and a 500-volt per second rate of rise to failure.

The strain relief test is similar that for vinyl tubing and consists mounting the tubing specimen on small diameter mandrel and subjec ing it to two hours at 300°C. It intended to give some indication the amount of shrinkage which ma occur in service due to release residual processing strains.

Specific gravity, coupled with sui able upper and lower limits, is d signed to indicate proper sinterin However, using the method of D79 even with a wetting agent, some di ficulty has been reported in obtainin reproducible results. Careful exan ination has shown small bubbles o the specimen surface. Good resul have been reported using the densit gradient method of D1505.

Apparent melting point is intende to show that the material is actuall polytetrafluoroethylene, and as pointed out, it is not a melting poi but merely a change from opaque t transparent.

The mandrel bend test is again control on proper sintering. Badl undersintered tubing will crac lengthwise if flattened by wrappin on a mandrel. Oversintered tubin will often crack at right angles to th tubing length when wrapped or ben over a small diameter. The metho consists of wrapping four turns of tub ing around a specified mandrel. Th tubing is then removed, straightene by unspecified means, and agai wrapped on the mandrel with the tub ing held in a position of 90 degrees t its original position on the mandre It is only necessary to place a lengthwise strip on a small diameter tubing wrap, unwrap, and attempt to wra at the required 90 degrees to see ho often the second wrap is actually a anything approaching 90 degree throughout its length. The intentio of the second wrap is to insure tha the tubing is creased along its lengt at more than two points on the circumference, since sintering might b non-uniform around the tubing du to local heating problems and, possibly, due to concentricity. Work i being done to improve the technique also, the stress at 200% elongation devised for MIL-I-22129A has been well received as a sintering control

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Industry News

The *Pantasote Co.*, Passaic, N. J., manufacturer of vinyl resins, has announced a profit of $82,229 (or $74,960 after taxes) for the six months ended July 31, 1960. Profit for the same period last year was $279,356. New facilities completed this fall can more than triple the company's output of polyvinyl chloride resin.

Magnetic Controls Co., an 8-year-old Minneapolis, Minn., electronics firm, recently completed its first public sale of stock by selling 233,000 shares for $700,000.

A fourth operating division, *Rotanium Electric Products Co.*, has been formed by *Premier Industrial Corp.*, Cleveland, to market 1,500 electrical maintenance products including terminals, connectors, conduit, and clamps.

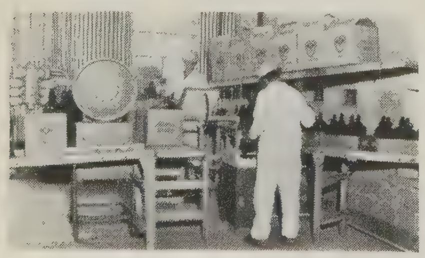
Narda Ultrasonics Corp., Westbury, N. Y., a partly-owned subsidiary of *Narda Microwave Corp.*, Mineola, N. Y., has begun bankruptcy proceedings. The only financial reflection on Narda Microwave, which makes microwave and UHF test equipment and components, reportedly is the reduction in the value of its Ultrasonic stock.

The Kendall Co., Polyken Sales Div. has announced new warehouse facilities in Los Angeles for "Polyken" electrical and industrial tapes.

Phalo Plastics Corp., Shrewsbury, Mass., has named *Wesley L. Wilson Co.* as sales representative throughout Wisconsin, Illinois, and Indiana.

Du-Co Ceramics Co., Saxonburg, Pa., has an expansion program underway which will provide an additional 6500 sq. ft. of floor space for improved research, development, warehousing, and shipping facilities.

Allied Chemical has announced completion of production and packaging facilities for the west coast's first major source of electronic chemicals at the El Segundo, Cal. works of its *General Chemical Div.* near Los Angeles.



Delsen Corp., Glendale, Calif., is now providing thermal conductivity and dielectric constant and dissipation factor at X-band frequencies testing services.

Measurement Control Devices, a wholly-owned subsidiary of *Schaevitz Engineering*, has been formed at Pennsauken, N.J. to develop instruments and systems for the use of dimensional control and measurement applications.

Carrier Air Conditioning Co. has announced that it will rebuild hermetic compressors in sizes from 2 to 15 horsepower in a new assembly operation to be established at Houston, Texas.

The Heinemann Electric Co., Trenton, N. J., has relocated to a new plant. The firm produces circuit breakers and relays.

American Super-Temperature Wires Inc., Winooski, Vt., a subsidiary of *Haveg Industries Inc.* and a supplier of high temperature wire, has expanded its research and development department so that the section now occupies almost 4000 sq. ft. The firm has also appointed *K. O. Brown Co.*, Dallas, Texas, as manufacturers' representative in Texas for wire and cable.

Thermal Wire of America, Keeler's Bay, South Hero, Vt., has announced completion of an extensive expansion program. The company makes high temperature wire and cable in a plant now triple the former size.

The McGraw-Edison Co. has announced that it has completed arrangements for the acquisition of the *American Laundry Machinery Co.*, Cincinnati.

Chemo Products Inc., West Warwick, R. I., has appointed the *Rex May Co.* in Dallas to represent the firm's line of fluorocarbon products.

Corning Glass Works has announced a doubling of floor space and equipment in the laboratory facili for ultrasonic delay line developm in the *Corning Electronic Compone* plant at Bradford. Pa.

Straza Industries, San Diego. Ca manufacturing firm. has announ the formation of a new electron division and the acquisition of *S idyne*, a San Diego electronics co pany.

A $200.000 expansion progra providing some 11.000 sq. ft. of add tional factory and office space, is u der way at the plant of *Permali In* Mt. Pleasant, Pa., producers of a tec nical plastic laminate.

Airite Products Inc., Los Angel titanium fabricator, has been pu chased for an undisclosed amount cash by the *Electrada Corp.*, Los A geles. Electrada expects to utili Airite's manufacturing capability f products to be developed by prese R & D programs in the areas of da processing, data retrieval, and spa age instrumentation.

William Brand-Rex Div.. Americ Enka Corp., Concord, Mass., has a pointed two new distributors for wire, cable, and tubing products. T *Huse-Liberty Mica Co.*, Peabod Mass., will service the entire Ne England area, and the *Wasson-Ga lagher Co.*, Oak Park, Ill., will cov Chicago, northern Illinois, and W consin. However, *Gassner & Cla Co., Chicago*, will continue to car Brand Rex's line of cast UHF plasti

A new West Coast warehouse f bare conductors manufactured by th *Ossining Div., Hudson Wire C* Ossining, N. Y., will be managed b its sales representative, *Perlmuth Ele tronic Associates* of Los Angeles, Sa Diego, and Palo Alto, Cal.

A Cleveland office to provide sal and service engineering coverage

REPORT FROM

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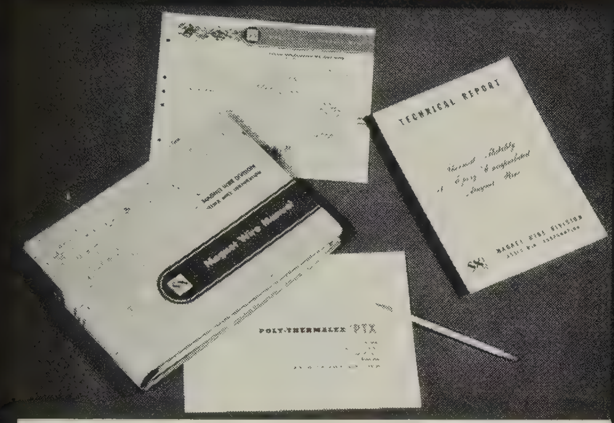

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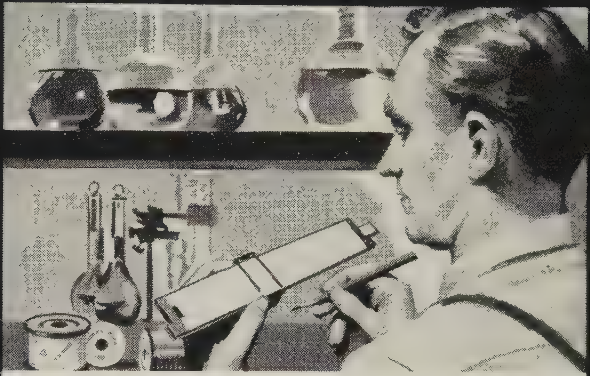

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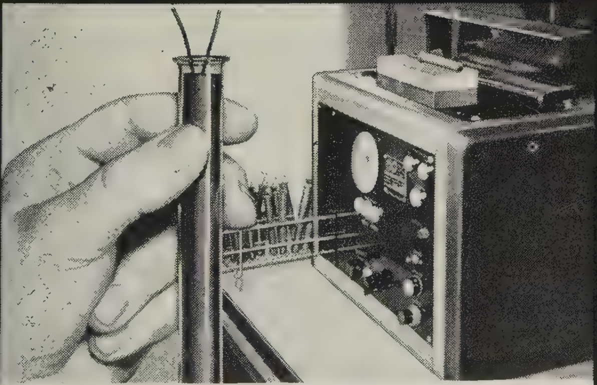

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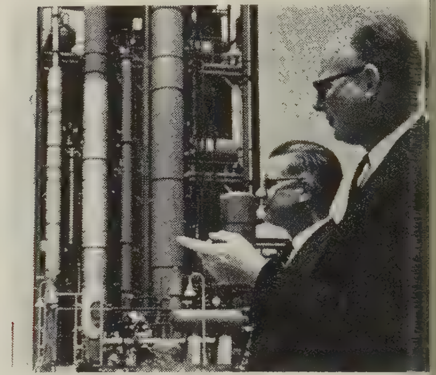
Ohio, eastern Michigan, western Pennsylvania, southern Indiana, Ohio, Kentucky, and West Virginia has been opened by *Hull Corp.*, Hatboro, Pa., manufacturer of vacuum furnaces, impregnators, potters, resin handling systems, and plastic molding presses.

An electrical testing station for extra high voltage underground cable has been opened at *Cornell University*, Ithaca, N. Y.

A new *General Electric Co.* plant is now producing polycarbonate resins on a 162-acre site at Mount Vernon, Ind. Initial manufacturing capability is over five million pounds of resin per year.



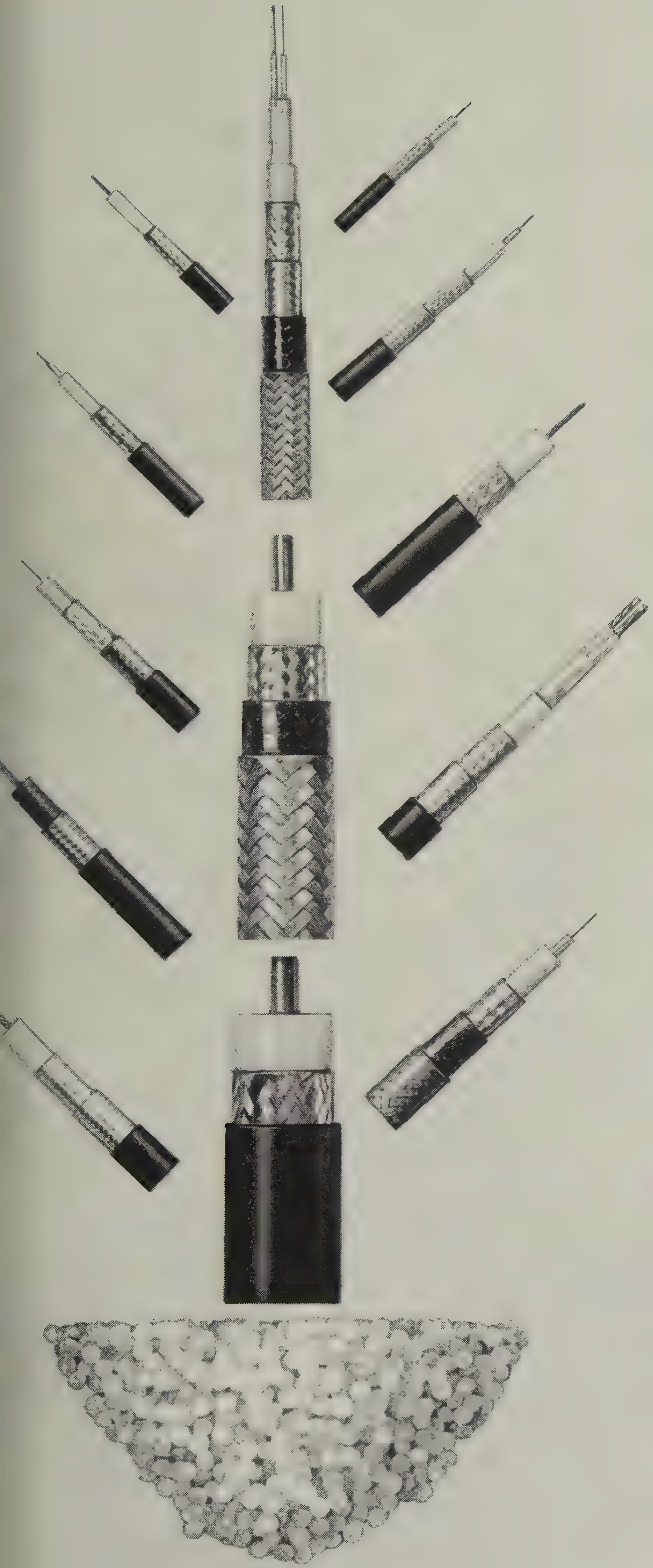
Dynex Industries Inc., manufacturer of electro-mechanical instrumentation and data computing systems, has moved to a new plant in Syosset, L. I., N. Y.

Prices on additional sizes of nylon tubular bars have been reduced up to 30% by *The Polymer Corp.*, Reading, Pa. In February, prices were reduced up to 50% on some sizes.

Ground has been broken in Farmingdale, N.Y., for *Polytechnic Institute of Brooklyn's* new *Graduate Center*, Long Island's first graduate school of engineering. Classes are expected to begin in the fall of 1961.

National Connector Corp., Minneapolis, Minn., has installed technical personnel and manufacturing facilities for glass-to-metal sealing. Also its Special Products Div. has been named a certified fabricator for General Electric Co. industrial laminates.

Julie Research Laboratories, manufacturer of resistors, networks, and primary-standard instrumentation has moved to new and larger facilities in New York City. A completely equipped environmental testing laboratory has been added.



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an Eastman plastic

- *Cable manufactured by Amphenol Cable & Wire Division, Amphenol-Borg Electronics Corporation, Chicago, Illinois.*
- *Both natural and black electrical grade Tenite Polyethylene are available to cable manufacturers in a unique spherical pellet form which flows freely in the extrusion process and in "air-veying" of bulk shipments from truck to bin.*

NO MOLDS—NO WASTE
NO MACHINING

PF EXTRUDED
TEFLON*
SHAPES
Reduce Cost of
Components
for electrical applications

Some of the many shapes extruded by Pennsylvania Fluorocarbon for the electrical and electronic industries include: shaped insulators, spacers, supporting channels and terminals.

These shapes offer:

- **a dielectric strength from 500 to 2000 volts/mil.**
- **stability—no change of electrical properties with temperature (-25° C. to +250°C.) or frequency (60 cycles to 100 mc)**
- **zero moisture absorption**
- **a continuous service temperature range of 250°C.—intermittent to 300°C.**

Extreme Dimensional Accuracy Assured On Any Appropriate Design

PF extruded shapes made from Teflon allow design engineers to incorporate the dielectric strength of Teflon into their products for electrical and electronic applications, economically. PF extrudes intricate Teflon shapes to extremely close tolerances, cuts them to lengths, post forms to requirements and performs any auxiliary machining steps. Molds are eliminated, there is no waste of Teflon and, frequently, no additional finishing operations are necessary. Result? Teflon components of extreme accuracy at lower cost.

Write, wire or call for a quotation on your particular Teflon component requirements, regardless of the intricacy of the shape. Shapes ranging from 2500 feet per pound to 6 feet per pound can be extruded.

PENNSYLVANIA FLUOROCARBON CO., INC.
1115 N. 38th Street, Phila. 4, Pa.
EVergreen 6-0603 TWX: PH 252
*Du Pont registered trademark

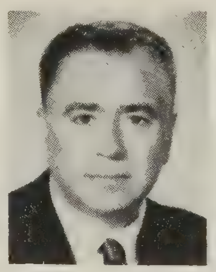
Print Ins. 40 on Reader Service Card

People in the News

E. Mark Wolf, formerly assistant chief engineer of the Rome Cable Div. of Aluminum Co. of America, has been named technical director of Rea Magnet Wire Co. Inc., Ft. Wayne, Ind.. Div. of Alcoa. He will head expanded research and development activities including projects concerning round copper and aluminum magnet wire and aluminum sheet and foil strip conductors.

The Western Operations Dept. of The Borden Chemical Co. has named the following district managers: *Francis W. Linehan* in the Washington and Canada areas, *Benjamin B. Butler* in the California area. and *John W. Runkel* in the Oregon, Southern Idaho. and Wyoming areas. The Polyco-Monomer Dept. of Borden has appointed *Alvin E. Jerome* as sales representative in the New England states.

Herman Sondov, executive vice president of Specialty Electronics Development Corp., Syosset, N. Y.. has been named chairman of the board. a post not previously filled.



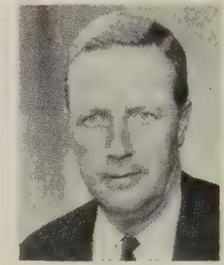
Herman Sondov

Marvin Kornhauser

Marvin Kornhauser, formerly vice president in charge of manufacturing for The London Machine Co., has been named production manager for Precision Mechanisms Corp., manufacturers of electromechanical systems and components, East Meadow, N. Y.

James D. Kelly has been named products sales manager for dielectric materials for William Brand-Rex Div. of American Enka Corp., Concord, Mass., producer of ultra-high frequency cast plastics. He joined the firm in 1958 as a development engineer.

Edward V. Z. Lane has been appointed director of market research and development of American Super-Temperature Wires Inc., Winooski Vt,. a subsidiary of Haveg Industrie Inc. He most recently has served a New England sales manager for Warren Wire Co. and previously had operated his own company.



E. V. Z. Lane

Frank Kelsey

Frank Kelsey, formerly with the Molded Fiberglass Co., has joined The Glastic Corp., Cleveland manufacturer of fiber glass plastic insulation. He will have sales engineering responsibility in the New York-New Jersey area.

Russel J. Keller, formerly general manager of American Machine & Foundry Co.'s Cleveland Welding Div., has been appointed general manager of the company's Buffalo Div. in Buffalo, N. Y.

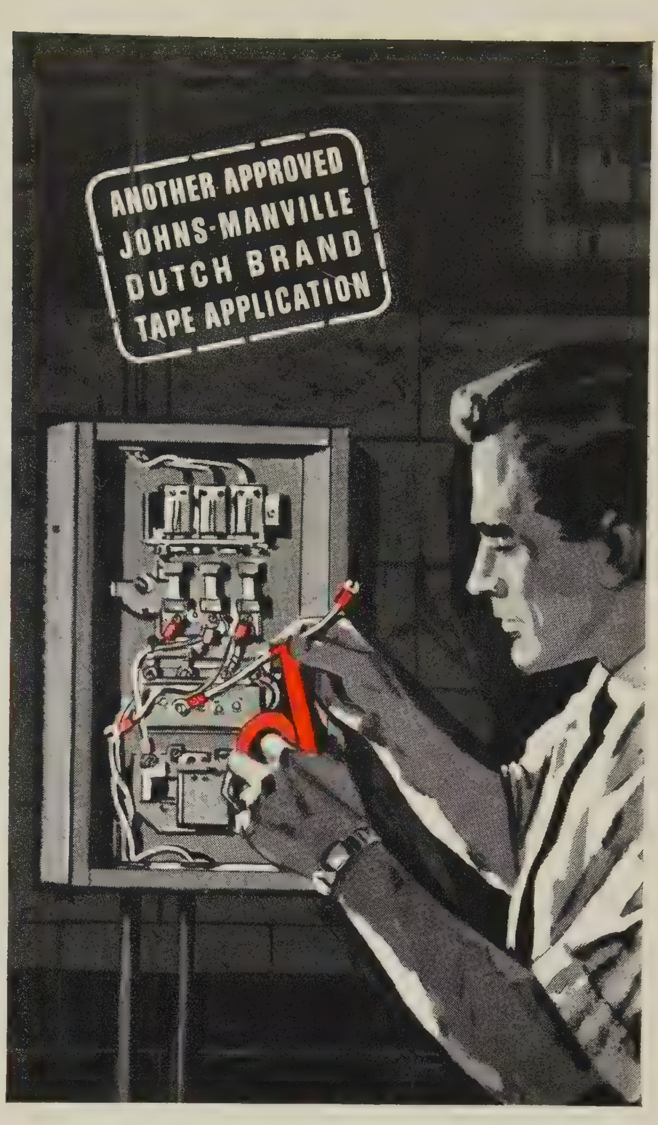
William E. Hood has been named chief engineer of the unitary equipment operation, a major department of Carrier Air Conditioning Co. He has been with Carrier since 1942.

H. K. Gladfelter, former East Orange, N. J. district manager for Formica Corp., laminated plastic producer. has been named eastern regional manager.

The Daven Co., Livingston, N. J., a subsidiary of General Mills Inc., has promoted *Frederick A. Schaner* to vice president in charge of engineering.

John L. Cook, formerly in the plastics department of Western Electric Corp., has been appointed mid-west manager for Hull Corp., Hatboro, Pa. manufacturer of plastic processing equipment.

Earl B. Beach Co., Pittsburgh electrical insulation distributor, has named *James C. LaBelle* as Philadelphia office manager. He formerly was purchasing agent for Air Design



For Identification and Protection
J-M DUTCH BRAND VINYL COLOR TAPE

There's no compromise with either identification or insulation when you color-code and protect pipes and electrical circuits with J-M Dutch Brand vinyl color tape. This tough and long-lived vinyl tape sticks tenaciously to any dry surface . . . resists galvanic corrosion, rot, mildew, fungus, water, oil, grease. Dielectric strength averages 10,000 volts; colors can't fade or wear off.

Dutch Brand Vinyl Color Tape does not sacrifice insulation or durability to achieve the added utility of color. Only 7 mils of film thickness, it has tensile strength of 20 lbs. per inch of width; adhesion of 35 oz. per inch of width; stretch of 150%. The U.L. temperature limit is 80° C.

Eight colors conform to standards of the National Electrical Manufacturers Association and include red, green, orange, blue, yellow, brown, silver, and white in a range of widths. Ideal, too, for non-electric purposes—coding pipe, defining areas, coding sub-assemblies, etc. Ask your supplier for Dutch Brand No. 128 in the color or colors you want.

USEFUL TIPS FOR TOP SAVINGS

You'll find dozens of stimulating tape-use ideas in this new, free J-M brochure. Please request on your business letterhead.

USEFUL TIPS for top savings and service
Johns-Manville Dutch Brand Electrical Tapes

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Corp. *Lewis Fink*, formerly sales manager for Electrical Maintenance & Equipment Co., has joined Beach as a salesman in Philadelphia.

Robert G. Bailey has been named New England sales manager for Warren Wire Co., Westwood. Mass.

Paul Cherkas has been elected president of Measurement Control Devices, a wholly-owned subsidiary of Schaevitz Engineering, Pennsauken, N. J., and producer of electronic devices.

Paul Cherkas

J. G. Wynn

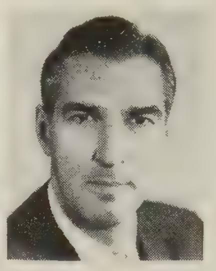
As part of a new marketing program, the two groups previously responsible for marketing liquid and flexible insulation materials have been consolidated at the Micarta Div. of Westinghouse Electric Corp., with *J. G. Wynn* named sales manager for all insulations. He had previously been administrative assistant to the vice president of the Westinghouse general products group.

Dan F. Sweet, former distributor sales manager, has been appointed general sales manager for the industrial plastic products plant of the Panelyte Div., St. Regis Paper Co., Trenton, N. J.

Ralph L. Lanz, with the company since 1936, most recently as general manager, materials, has been elected vice president, materials, and a member of the board of directors, Keasbey & Mattison Co., Ambler, Pa.

Daine Maxwell has been named a senior engineering specialist at the Amherst Laboratory of the Buffalo operations of Sylvania Electric Products Inc., Buffalo, N. Y. At Mountain View, Cal., *Dr. William J. Perry* has been named manager of the newly created Advanced Systems Laboratory, a part of the Electronic Defense Laboratories of Sylvania. Also at Mountain View, *LeRoy W. Evans* has been appointed manager of the signal processing department at the Electronic Defense Laboratories. *Glenn H. Sacra* has been named manager of technical liaison for the Waltham, Mass. laboratories of Sylvania Electronic Systems.

G. H. Sacra


Jack Slatky

Jack Slatky has joined the sales staff of Coast Pro-Seal and Mfg. Co., Los Angeles.

James I. Adler, formerly with CBS, has been named production engineer for the Equipment Div., North Hill Electronics Inc., Glen Cove, N. Y.

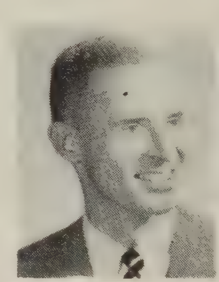
At the National Bureau of Standards, Washington, D. C., *Dr. Martin G. Broadhurst* has joined the Dielectrics Section to investigate problems in the general field of dielectric properties from the standpoint of molecular behavior. *Ernest M. Levin*, a physical chemist with the Constitution and Microstructure Section of NBS, has received a U. S. Department of Commerce Silver Medal for very valuable contributions to phase studies. *Dr. Harold O. Wyckoff*, chief of the X-ray Section, has received a Gold Medal for outstanding scientific research in the field of radiation shielding and measurements. *Dr. Chester H. Page*, chief of the Electricity Div., has received a Gold Medal for rare and outstanding contributions in the field of electronics, ordnance, and physical research and measurements. *Myron C. Selby*, chief of the High Frequency Electrical Standards Section in Boulder, Colo., has received a Silver Medal for outstanding scientific achievement in radio standards and radio measurement techniques. *David M. Kerns*, assistant chief of Microwave Frequencies at Boulder, has received a Silver Medal for outstanding performance in the development of national microwave standards and measurement techniques.

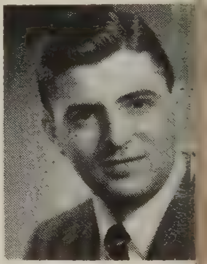
At The Borden Chemical Co., a division of The Borden Co., New York City, *William R. Moffitt* has bee appointed senior vice president fc manufacturing and engineering an Samuel Loshaek has been name director of product development.

Roy D. Wilson has been name general manager of F. J. Stokes Co. c Canada Ltd., a subsidiary of F. Stokes Corp., Philadelphia manufa turer of processing equipment.

The Clayton Mark & Co., Evanston Ill., manufacturer of pumps and ele trical conduit, has appointed *Jame Oakley* as director of manufacturin and *Carl V. Schroeder* as purchasin agent.

The Silicone Products Dept., Ge eral Electric Co., Waterford, N. Y has named *James B. Lovell*, with th company since 1955, a sales repr sentative for the central district i Milwaukee, while *G. Stephen Glase* has been appointed sales representa tive of the eastern district in Newar N. J. He has been with G-E sinc 1958.


J. B. Lovell

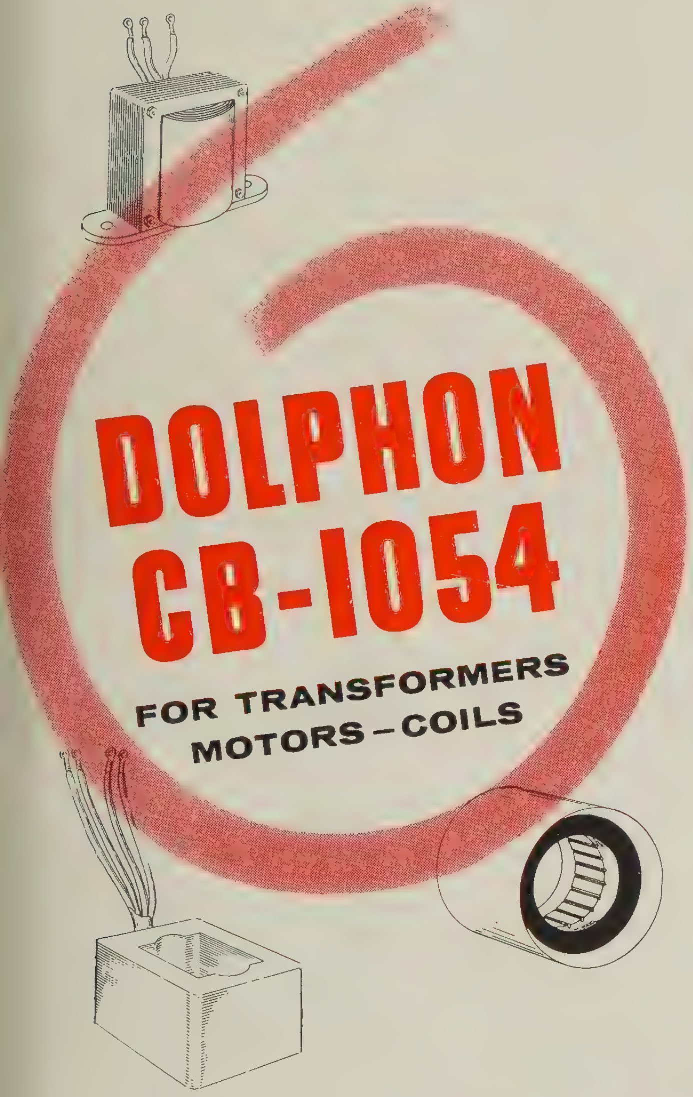

G. S. Glaser

Marvin L. Beck has been name manager of manufacturing for Ge eral Electric Co.'s High Voltag Switchgear Dept., Philadelphia. H has been manager of the Murfree boro, Tenn. plant since August 195 The Laminated Products Dept. General Electric Co. has establishe a new western states district sales c fice in Phoenix, Ariz. to market "Te tolite" industrial plastic laminat with *John E. Martin* named wester states representative. The Insulatin Materials Dept. of G-E has opened new sales office in St. Louis wi *David M. Bradfield* in charge.

Schenectady Varnish Co. In Schenectady, N. Y., has appoint *Andre J. Bourgeois* as purchasin agent. With the company since 195 he has served in various manufactu ing and finance capacities. The fir has also announced that *George*

T'S HERE!

a flexible epoxy resin



Now you can quickly and easily encapsulate and impregnate your transformers, motors and coils, getting the flexibility and penetration you need and want with Dolphon CB-1054 epoxy resin.

This "easy-to-apply" general purpose resin, which meets the requirements of MIL-T-27 for class B insulation, has excellent flexibility and extremely low viscosity. It provides a quick cure at moderate temperatures and has an extended pot life of four to six weeks.

CB-1054 is a two-part resin that is mixed by one to one weight ratio. Both parts are very stable and completely deaerated.

You will find CB-1054 competitively priced with other resins not having these product advantages!

CHARACTERISTICS

CURE		VISCOSITIES & POT LIFE		
HRS.	TEMP. °F	°F	CPS.	POT LIFE
8-12	225	75	8000	4 to 6 Wks.
5-8	250	110	2000	30 to 36 Hrs.
3-5	275	130	1200	10 to 12 Hrs.
—	—	150	950	6 to 8 Hrs.

SPECIAL OFFER

A 2 lb. sample of CB-1054 (1 lb. each of parts A and B) is available to you at the low trial sample price of $3.50. Send for yours today.

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JOHN C. DOLPH COMPANY
INSULATING VARNISH SPECIALISTS
MONMOUTH JUNCTION, NEW JERSEY

Licensees: England: The Walpamur Co. Ltd., Darwen, Lancashire • **Italy:** Societa Albesiano, Moncalieri (Torino) • **Canada:** Crown Diamond Paint Co. Ltd., Montreal • **Chile:** Sociedad Quimica Nacional "Soquina", Santiago

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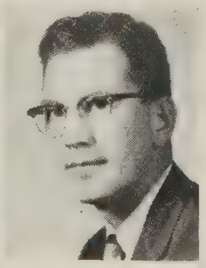
Borthig has been named technical representative for insulating varnishes in the Greater New York Metropolitan territory. He had previously been with the George C. Borthig Co.

At the Silicones Div., Union Carbide Corp., New York City, *J. C. Malone* has been appointed assistant to the general manager. He had been assistant superintendent at the Institute, W. Va. plant of Union Carbide's Chemicals Co. *W. J. Prevost*, with the company since 1952, has been named office manager of the Detroit district office of Union Carbide Plastics Co. The company has also named three technical representatives — *John B. Hollingsworth* in the north central sales region (Cleveland), *Richard A. Behrens*, also in the north central sales region (Cleveland), and *Arthur Kneessy*, also in the north central sales region (Rochester, N.Y.)

John C. Jacobs has been named to head the expanded sales program of Columbia Technical Corp., Woodside, N. Y., manufacturer of insulation and electronic components. He was the national sales manager for the Mount Vernon Division of Litton Industries.

Chemo Products Inc., West Warwick, R. I., manufacturer of coated glass yarns and "Teflon" products, has appointed *George J. Scheuer* to the newly created position of manager of the Plastics Div. Scheuer previously was with the William Brand-Rex Div., American Enka Corp., for seven years.

G. J. Scheuer



A. J. Foley

Alfred J. Foley, formerly with Sigma Instruments Co. for 14 years, has joined the sales staff of Viking Wire Co. Inc., Danbury, Conn., manufacturer of magnet wire.

Nuclear Corp. of America, Denville, N. J., has appointed *James M. Constable* manager of the Instrument & Research Div. which makes industrial nuclear process control instrumentation and military tactical survey meters. He was most recently with Electronic Products Co.

Bernard J. Perry, formerly with the Daven Co., Livingston, N. J., a subsidiary of General Mills Inc., has been appointed vice president in charge of Daven's Laible Manufacturing Div. *Albert M. Steinbach*, with the company since 1958, has been named vice president in charge of production.

A. M. Steinbach

B. J. Perry

At the Washington laboratories of the National Bureau of Standards, a new Instrumentation division has been formed with *G. Franklin Montgomery* as chief. *Joshua Stern* has been named chief of the Basic Instrumentation Section within the division. Chief of the newly formed Electricity Div. (composed of the Resistance and Reactance, Electrochemistry, Electrical Instruments, Magnetic Measurements, and Dielectrics sections of the old Electricity and Electronics Div.) is *Dr. C. H. Page*. In other NBS appointments, *Dr. Ugo Fano* and *William A. Wildhack* have been named special assistants to the director and *Dr. K. E. Shuler* has been named consultant to the director.

A. D. Stone Jr., with General Electric Co. since 1953, has been named West Coast sales representative for G-E insulating materials to succeed *R. J. Hedberg*, who has returned to the Schenectady, N. Y. headquarters as distributor specialist with the Insulating Materials Dept. New representative for G-E's industrial laminated plastics in Minnesota, Wisconsin, and Iowa is *Robert F. Lindly*.

John Sloat, formerly with Firestone Plastics Co., has joined L. Frank Markel & Sons, Norristown, Pa., manufacturer of insulating tubing and wire, as production manager of the Hygrade-Flexite Div.

At the Inorganic Chemicals Div., Monsanto Chemical Co., St. Louis *James F. Combs* has become leader o a newly formed instrument research group to develop products for use i the electronics field.

R. L. Whearley, formerly executive vice president, Rea Magnet Wir Co. Inc., Fort Wayne, Ind., has bee elected president to succeed Samue A. Rea, who resigned to devote ful time to other business interests. Re continues as a member of the boar of directors.

Union Carbide Plastics Co., division of Union Carbide Corp., has ap pointed John D. Benedito vice-president — special projects, and name *Richard M. Joslin* vice-president— sales. Both men joined the UC organization in 1935.

At the Electrical Conductor Div. Kaiser Aluminum & Chemical Sale Inc., Newark, Ohio, *Neil K. Barr* previously chief engineer, has bee appointed technical manager; *Joh B. Roche* has been named chief engineer for overhead conductor products; and *Roger S. Keith* was promoted to chief engineer for insulate products.

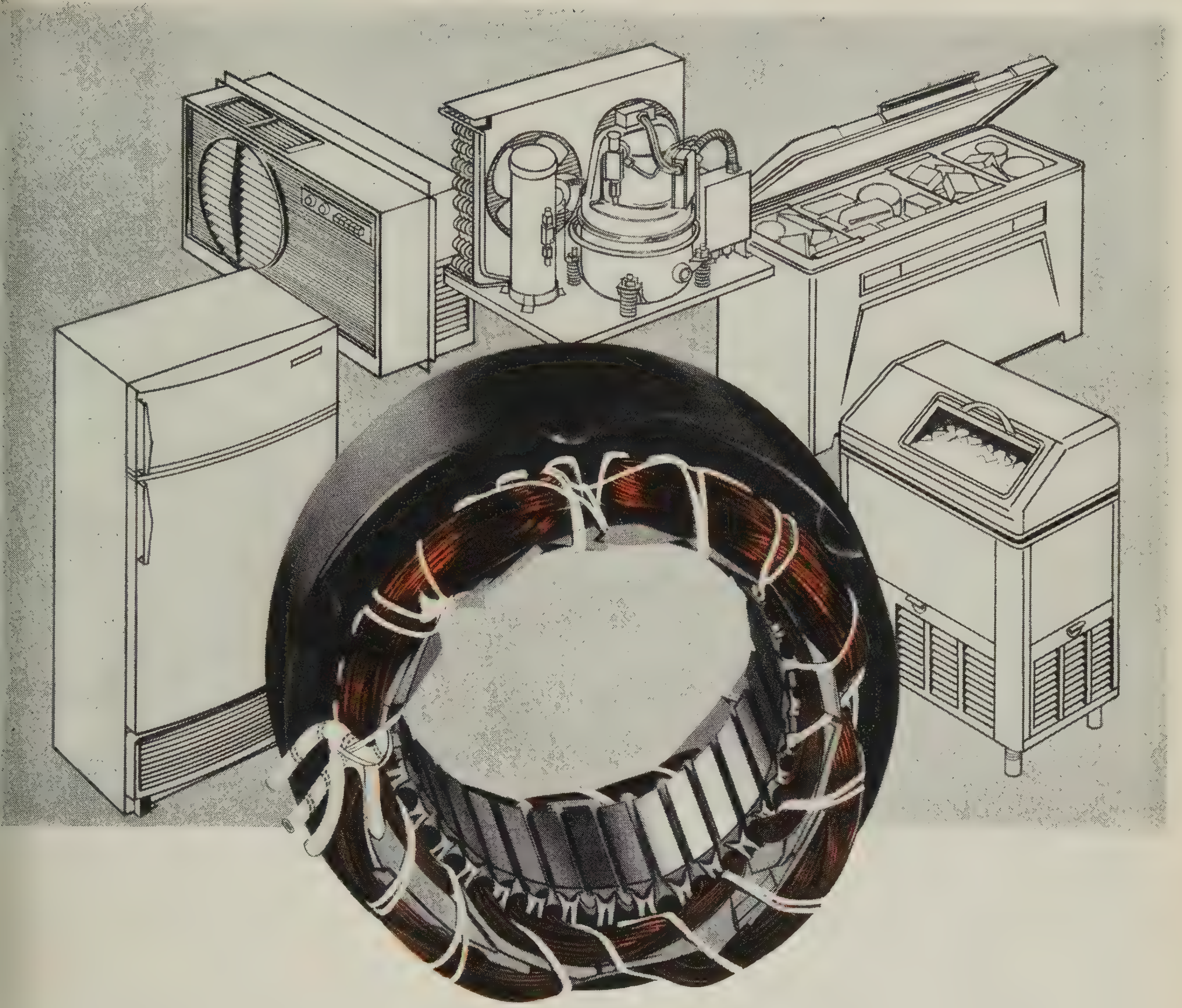
N. K. Barr

J. B. Roche

R. S. Keith

K. R. Wuensch

Karl R. Wuensch, with Cornin Glass Works since 1946, has bee named manager of a new plant to b built at Raleigh, N. C., by Cornin Electronic Components to manufacture glass capacitors and other electrical and electronic components *David W. Brown* will succee



Outstanding new Formvar-type wire specifically for hermetic motors using R-22...

PHELPS DODGE HERMETEZE

- Excellent resistance to softening and extraction by R-22 and R-12 refrigerants.
- Exceptional resistance to all conventional solvents.
- Outstanding ability to take heat and pressure without excessive physical softening—provides maximum protection against short time, high overload stress on windings.
- Excellent chemical stability—good resistance to hydrolysis.
- Retains flexibility in hot oil.
- Retains dielectric at operating temperature.
- No sacrifice of physical or electrical properties over hermetic Formvar.

Hermeteze is Phelps Dodge's new Vinyl Formal-Urethane magnet wire for hermetic motors operating in R-22 and R-12 refrigerant gases and oil. It represents a major advance in film wire insulation designed for hermetic unit operation. In addition to having all the excellent physical, chemical and electrical properties of Formvar, Hermeteze offers remarkably improved properties for protecting windings against failure from plastic flow at overload conditions.

Any time your problem is magnet wire, consult Phelps Dodge for the quickest, surest answer!

Formvar®-Shawinigan Resins

FIRST FOR LASTING QUALITY—FROM MINE TO MARKET!

PHELPS DODGE COPPER PRODUCTS
CORPORATION
INCA MANUFACTURING DIVISION
FORT WAYNE, INDIANA

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Wuensch as production superintendent at the Bradford, Pa., headquarters of Corning Glass. Production superintendent of the new plant will be *Glenn R. Yeakey*, and plant quality and process engineer will be *Norman M. Edelson. Joseph P. Joyce* will succeed Yeakey as plant quality and process engineer at Bradford. At the Danville, Ky., tubing and bulb plant, *Harry H. Marts* has been named plant manager to suceed *William E. Stroud*, who has been appointed manager of processing technology in Corning's Engineering Div.

Continental-Diamond Fibre Corp., Newark. Del., manufacturer of laminated plastics, vulcanized fibre, and insulating materials, has assigned *Ralph Little Jr.* as senior salesman in southern California.

Simon Fisher, general manager of National Electric Welding Machines Co., Bay City, Mich., has been elected president to succeed *Edward C. Smith*, who has moved up to the newly created office of chairman of the board. Fisher continues as general manager.

E. C. Smith

S. Fisher

Daniel M. Sullivan, research chemist at Shawinigan Resins Corp., Springfield, Mass., has been awarded academic leave for a year at full salary and a tuition-free scholarship by the company.

Lewis W. Imm has resigned as president of Librascope Div., General Precision Inc., Los Angeles, Cal., computer manufacturer. He continues as a special consultant. *William E. Bratton*, with the company 13 years and most recently executive vice president, is the new president.

Roger E. Dumas, with the firm since 1957, has been appointed director of research and development, Inductive Products Div., Statham Instruments Inc., Los Angeles.

American Machine & Foundry Co. has appointed *Charles H. Bell* manager of its Greenwich (Conn.) Engineering Division's New Programs Group. He formerly was customer services manager of the central region, Government Products Group. *John N. Albaugh*, the former New Products Group manager, has been moved up to manager of planning, Government Products Group.

At the Hysol Corp., Olean, N. Y. manufacturer of coatings, *Dr. Cataldo Cialdella* has moved up from director of research to director of research and development, *James Hornburg* has been named supervisor of technical services, and *Henry Markowski* has been given responsibility for development of high heat resistance of epoxy resins.

C. Cialdella

J. Hornburg

Dr. E. John Whitmore, formerly chief engineer for the Canadian Marconi microwave tube plant in Montreal, has joined Sylvania Electric Products Inc. as manager of development engineering at the Special Tube Operations, Williamsport, Pa.

After special assignment with C. Stellarator Associates Inc., *A. E. Kelgour* has rejoined Allis-Chalmers Manufacturing Co., Milwaukee. He will aid in coordinating products and engineering services with the electrical power industry growth. In Engineering Services, a new group, *R. C. Allen* has been appointed senior engineering consultant, and L. J. Linde has been named director. Allen had been director of mechanical engineering, Industries Group, and Linde was most recently manager of C. Stellarator Associates, a group of A-C and RCA engineers and scientists engaged in fusion research at Princeton University.

Francis A. Kraft, formerly assistant manager of the New York-Philadelphia sales territory for Becco Chemical Div., Food Machinery and Chemical Corp., has been promoted
New England manager with hea
quarters in Framingham, Mass.

F. Kraft

V. Steinmeyer

Virgil Steinmeyer, most recen
eastern regional sales manager f
The Electric Autolite Compan
Wire and Cable Division, has be
named product manager for the di
sion with headquarters in P
Huron. Mich.

Warren S. Jones, who joined Tin
Wire and Cable Div.. The Inter
tional Silver Co., Wallingford, Con
in January 1960, has been appoint
distributor sales manager for R/G
axial cables.

Isochem Resins Co., Providen
R. I., has appointed *Joseph W. Ab*
ham, formerly with Chemical Pr
ucts Inc., as technical director
epoxy resin research and devel
ment.

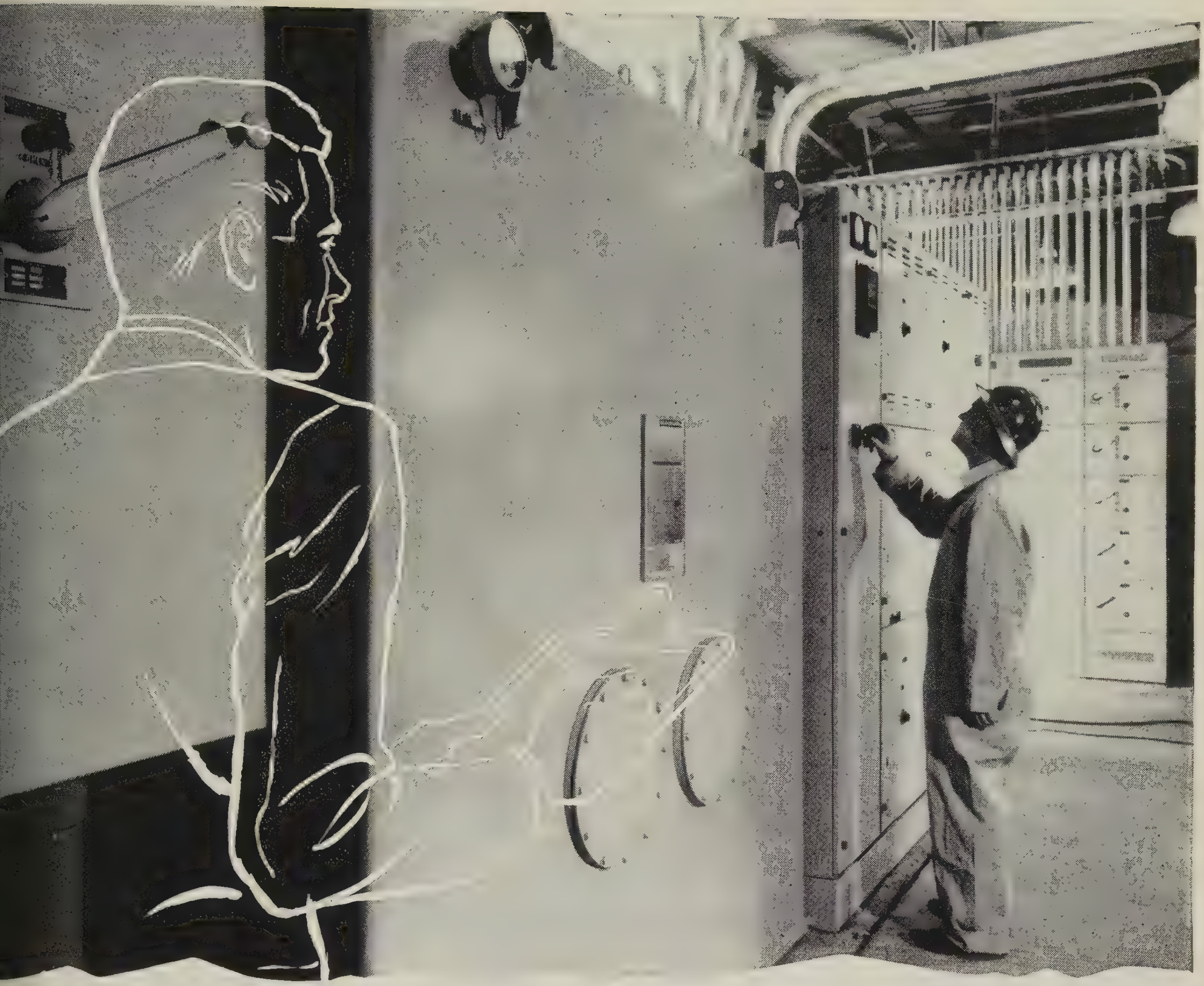
Crestmont Consolidated Corp., S
Marino, Cal., which recently est
lished an Electronics Div. in Burba
Cal., has elected to its board of dir
tors *Cameron G. Pierce*, president
Ling Electronics, Los Angeles.

New transducer engineer at Te
nology Instrument Corp. of Califor
is *Graham Barr*, previously with Su
mers Gyroscope.

G. Barr

T. J. Horan

Anaconda Wire & Cable Co.
appointed *Thomas J. Horan*, form
with Army Ordnance at Frank
Arsenal, as product manager for
sile cables and manager of the
Anaconda Defense Electronic S
ices, Orange, Cal.



HOW THE SILICONES MAN HELPED BUILD A BIGGER SEALED, DRY TYPE TRANSFORMER

YEARS ago, after consulting the Silicones Man, a major manufacturer designed and built one of the first *big* Class H, sealed, *dry type* transformers. Nitrogen-filled, the unit had what was a phenomenal rating for dry types—*1000 KVA, with a temperature rise of 160°C*—transforming 4160 volts to 440 volts, three phase.

The insulation which made this possible was UNION CARBIDE R-620 Silicone Impregnating Varnish—today, a standard of the industry.

Now your Silicones Man continues to introduce more "firsts." For example, UNION CARBIDE XR-65 Silicone—a 100 per cent reactive resin—for Class H coils and electrical equipment. This new solventless resin cures in thick sections at temperatures as low as 125°C. Yet it meets AIEE 220°C. ratings, withstanding starting and surge loads involving temperatures up to 250°C.

If you have not yet investigated R-620 and XR-65 Silicone Varnishes for high temperature electrical applications, contact your Silicones Man for information. He has offices in many cities. Or write Dept. KI-6002, Silicones Division, Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada:* Bakelite Division, Union Carbide Canada Limited, Toronto 7, Ontario.

Unlocking the secrets of silicones

Rubber, Monomers, Resins, Oils, Emulsions

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UNION CARBIDE SILICONES

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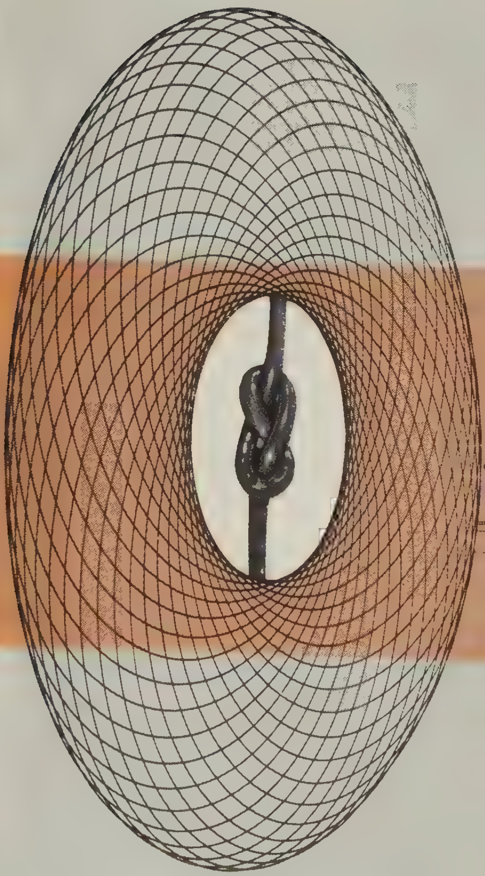
BRAND-REX

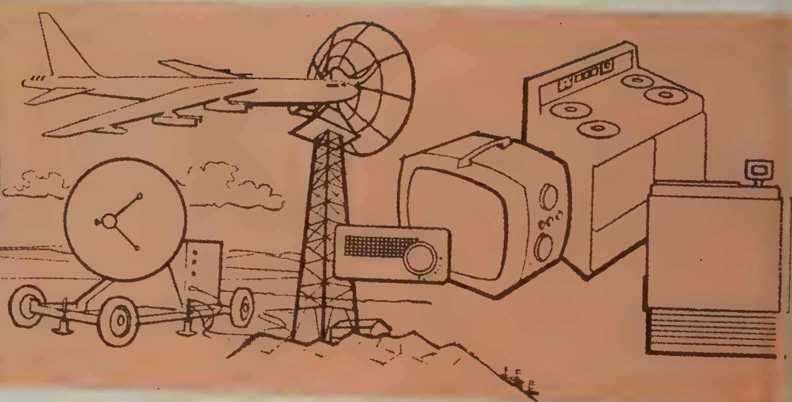
TURBO® INSULATING SLEEVINGS

Circle the entire range of Tubular Dielectrics

To solve insulation problems or to spark new ideas . . . Brand-Rex Turbo sleevings run the spectrum of insulating materials . . . from extruded polyvinyl chloride and teflon tubing to a complete line of cotton, rayon, and glass braids coated with vinyl, silicone, silicone rubber or alkyd varnishes. A complete range of sizes in classes A, B, F and H. Both tubing and zipper tubing configurations available.

Important, too, is the reliability built into Turbo products. Reliability based on the experience of 40 years and the capability of a technically-oriented organization with three plants located from coast to coast, all backed by the vast resources of the American Enka Corporation. It makes sense to call Brand-Rex!





This comprehensive brochure and sample board give complete technical information. Write for yours today.

WILLIAM BRAND-REX DIVISION

American ENKA Corporation

DEPT. T, 36 SUDBURY ROAD, CONCORD, MASSACHUSETTS
Vinyl, Teflon, Polyethelene, Nylon and Silicone Rubber Wires and Cables
Electrical Tubing and Sleeving — UHF Cast Plastics — Plastic Extrusions

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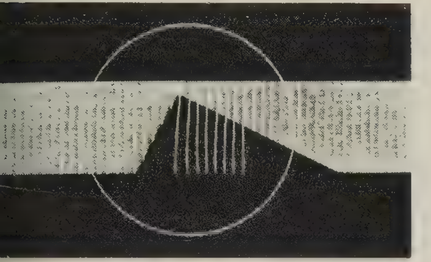
New Products

For further information on these roducts print the item number on he Reader Service Inquiry Card on he back cover. Fill out and mail the ard—no postage is required. Insuation *will immediately forward your nquiry to the manufacturers conerned so that they can send you more nformation promptly.*

Ion-Woven Fiber Glass rmature Banding Tape

A new non-woven, cross reinforced iber glass armature banding tape that vill be known as "Vec-O-Tex" is said o offer many time and money saving n-shop advantages, such as ultra igh hoop, tensile, and cross tensile trength; less material needed; does ot split during application; and eliminates the need for edge restraints. It is also stated that cured bands of this new material will not crack and that it can be made with precise width and thickness control. Superior surface finish is reported. Booklet available. Coast Manufacturing and Supply Co., P. O. Box 71. Livermore, Cal.



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Synthetic Mica Paper For Use to 1000°C

New "Synthamica" 202 synthetic mica paper, which is said to have a melting temperature of 1365°C and an operating temperature up to 1000°C, is expected to be used in high temperature transformers, motors, and capacitors. Excellent electrical properties claimed include a dielectric constant of 3-4 with a dissipation factor of .0005-.0020, a dielectric strength of 600-1000 vpm, and volume resistivity 5 × 10^{15} ohm/cm at room temperature. Good mechanical properties (including a tensile strength of 5,000-10,000 psi) are also reported, making it an excellent material for components for such electronic devices as computers, radar. and missile-guidance systems. It is available in continuous strips of 3″ width or sheets up to 6″ diameter with a thickness range of .002 to .007″. Through special lamination processes the basic papers can be built up to a greater thickness if required. Synthetic Mica Co., 20 Passaic Ave., Caldwell Township, N. J.

Print No. Ins. 101 on Reader Service Card

Color-Coding Tape Dispenser

From 300 to 1,700 wire markings for $1.50 are available with a new combination spool-dispenser carton of vinyl color-coding tapes. "Slipknot 45" color-coding tape, a 4-mil tape in six standard identification colors, comes in a package containing a ½-inch by 20-foot roll of each color, for all color-coding usage. It is not an electrical insulating tape. The new package holds all six rolls together to eliminate waste through loss and dirt in the average toolbox, and each color can be dispensed from the carton without removing the roll. The rolls are held in the box on a wooden core, which is removable easily for replacement of any one or all rolls. The colors —green, orange, blue, yellow, red, and white—are permanent and colorfast. The formulation is permanent—the same as is used in Slipknot No. 7 plastic electrical tape. The entire package measures only 3½″ × 2½″ × 2½″. Plymouth Rubber Co. Inc., Canton. Mass.

Print No. Ins. 102 on Reader Service Card

BRAND-REX TURBO® INSULATING SLEEVINGS

Circle the entire range of Tubular Dielectrics

To spot the insulation materials that will solve your problem, just glance through this list of Turbo tubings and sleevings:

Applicable Specifications	Operating Temperature
TURBO† Varnished Cotton and Rayon	
MIL-I-3190A NEMA VS1-1957, Type 1 A.S.T.M. D-372	-10° to +105°C
TURBOGLAS† Varnished Glass	
MIL-I-3190A NEMA VS1-1957, Type 2 A.S.T.M. D-372	-10° to +130°C
TURBOTUF† Vinyl Coated Glass	
MIL-I-21557 MIL-I-3190A NEMA VS1-1957, Type 3	-10° to +130°C
TURBONITE† Isocyanate Coated Glass	
Class F Material	-10° to +155°C
TURBOSIL† Silicone Varnished Glass	
MIL-I-3190A NEMA VS1-1957, Type 4	-10° to +200°C
TURBO 117† Silicone Rubber Coated Glass*	
NEMA VS1-1957 TYPE 5	-73° to +200°C
TURBOTHERM 105† Vinyl	
U/L A.S.T.M. D-922, Grade C	-17° to +105°C
TURBOLEX 105† Vinyl	
MIL-I-631C, Grade c	-20° to +105°C
TURBOLEX 85† Vinyl	
A.S.T.M. D-922, Grade A	-32° to +60°C
TURBOLEX 76† Vinyl	
MIL-I-631C, Grade a	-39° to +80°C
TURBOLEX 40† Vinyl	
MIL-I-22076	-55° to +80°C
TURBOZONE 40† Vinyl	
MIL-I-7444B	-67° to +75°C
TURBOTEMP Teflon	
MIL-I-22129A AMS-3653 B**	-200° to +250°C

**Also meets applicable performance requirements of MIL-I-631C and MIL-I-3190A

*Meets performance requirements of MIL-I-3190A

†Registered trade mark

Turbo Tubings are available in all sizes from #24 to 2½″. Write for complete information.

BRAND REX

WILLIAM BRAND-REX DIVISION

American Enka Corporation
SUDBURY ROAD, CONCORD, MASS.

Print Ins. 46 on Reader Service Card

Flame-Retardant Clad and Unclad Phenolic-Paper Laminate

New "Insurok" T-777 is a paper-base, phenolic laminate said to have exceptional flame-retardant characteristics. It is available copper-clad or non-clad. The laminate is reported to be "self-extinguishing with zero inches burning distance," to meet NEMA XXXP requirements, and to have all the flame retardance required by presently-known specifications. Along with excellent flame retardance, which is believed to be permanent at normal operating temperatures, T-777 is also stated to possess good electrical properties, fine dimensional stability, and superior punching qualities. T-777 is classified as a hot-punching grade and requires moderate heating. These properties and relatively modest cost are expected to suit it for use in radio, tv, electrical and electronic components, and computer applications. The Richardson Co.. 2735 Lake St., Melrose Park, Ill.

Print No. Ins. 103 on Reader Service Card

Single Component Epoxy Coating

A new 100% solids epoxy, single component coating is designed for continuous operation up to 155°C. HumiSeal Type 1F56 is said to require no mixing and may be used directly from the shipping container. The rigid epoxy system is curable at elevated temperatures for a short period of time. The viscosity may be adjusted to yield builds of 10 mils and thicker. The coating may be applied either by dip or brush. Columbia Technical Corp., 24-30 Brooklyn-Queens Expressway West, Woodside 77, N. Y.

Print No. Ins. 104 on Reader Service Card

Spray Powders for High Temperature Ceramic Coatings

A wide range of boride, carbide. nitride, and oxide ceramic powders can be used in plasma arc spraying equipment to provide high temperature coatings. Unusual electrical properties and resistance to corrosion and erosion are reported. Spraying powders in the size range of —150 mesh +325 mesh (which seems most suitable for non-metallic high temperature materials) and in four other particle size ranges are available. Norton Co., Electro-Chemical Div., P.O. Box 87, Niagara Falls, Ontario, Canada.

Print No. Ins. 105 on Reader Service Card

Phenolic Varnish Produces Flame-Retardant, Cold-Punching Electrical Laminates

New "Resinox" 495 is claimed to be the first phenolic varnish to produce a flame-retardant. high electrical grade laminate with excellent cold punching properties. Paper-based industrial laminates impregnated with the new phenolic varnish reportedly meet the electrical, physical, and mechanical requirements of NEMA standards and Underwriters' Laboratories test for flame resistance. Resinox 495 laminates are especially recommended for printed circuits used for commercial radio and TV applications and as copper-clad laminates for electronic computers and military applications. Technical data bulletin available. Dept. PV, Plastics Div,. Monsanto Chemical Co.. Springfield 2, Mass.

Print No. Ins. 106 on Reader Service Card

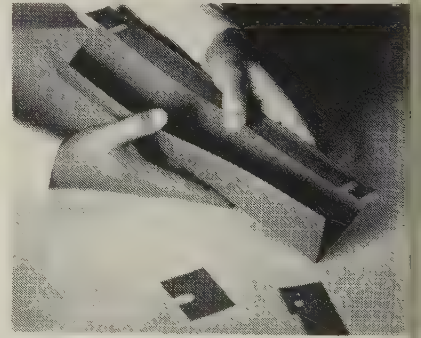
Resins for Wire Coatings

Buton resins, a new line based on butadiene-styrene polymers, are said to offer surface coating manufacturers advantages in performance and economy. The resins for coating wire and other products are available in three forms—Buton 100, 200, and 300. Buton 100, the basic polymer, is composed of 80% butadiene and 20% styrene. It has a low molecular weight (8,000-10,000) and high unsaturation, with an iodine number of approximately 300. Buton 200 and 300, which are modified polyme
are made by reacting Buton 100 w
a polarizing agent in the presence
a catalyst to introduce polar hydro
and carbonyl groups. The resins m
be cured over a wide range of con
tions varying from a few minutes
room temperature to a few secon
at flame-curing temperatures. Use
the flame-cure process is claimed
enhance the properties of Buto
Properties reported include electri
and chemical resistance. high bu
and gloss, adhesion, pigment wetti
tolerance for inexpensive solvents, a
wide compatibility with other res
and modifiers. Enjay Chemical Co.
Div. of Humble Oil & Refining C
15 West 51st St., New York 19.

Print No. Ins. 107 on Reader Service Card

Flame-Resistant Vulcanized Fibre

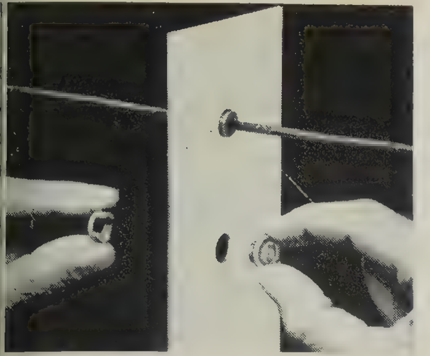
Pyronil "E," a new electrical gra
of flame-resistant vulcanized fibre
stated to have improved dielect
strength and arc resistance and
provide increased protection agai
electrical fire hazards at low co
Rated non-burning under ASTM p
cedures D-635 and D-568, the m
terial is intended for use as a co
bination flame. heat, and dielect
barrier in electrical and electro
equipment. Its low initial cost a
ease of fabrication reportedly w
cut costs in the manufacture of da
processing equipment, business m
chines, radio, television, and app
ances. Pyronil "E" in 1/32″ thi
ness has a dielectric strength of 2
vpm under ASTM test method D-1
and arc resistance of 50 seconds unc
ASTM test method D-495. Gray
color, Pyronil "E" is available in ro
coils, or sheets in thicknesses of .01
to 1/16″. National Vulcanized Fi
Co., 1060 Beech St., Wilmington, D



Print No. Ins. 108 on Reader Service Card

nap-Lock Plastic Grommet Mounts, nsulates Wire, Cable, or Tubing

Wire, cable, or tubing can be insulated and supported from a mounting panel, chassis, wall, housing, or similar surface with a Budwig plastic grommet. Identical halves of the complete grommet are inserted in the panel hole, one from each side of the panel, and snapped together. They lock in place and provide a rigid bearing surface with dielectric, chemical, and wear resistance. Any color, any plastic material can be used for color coding or special applications. Budwig Manufacturing Co., P.O. Box 4212, Glendale 2, Cal.



Print No. Ins. 109 on Reader Service Card

Synthetic Wax for Dielectric Coatings and Encapsulations

A new synthetic wax with a melting point of 156°C (313°F) is also said to have a very high flash point and good electrical insulating properties. It is claimed to be insoluble in all solvents at ordinary temperatures and to be compatible with paraffin and microcrystalline waxes, vegetable waxes, fats, esters, hydrogenated castor oil, and rosin. Small amounts of this wax reportedly raise the melting points of the preceding considerably. Thus 10% added to paraffin wax raises the melting point to 142°C. The hard brown Ross Wax 160 is suggested for dielectric coatings and encapsulations. Frank B. Ross Co. Inc., Jersey City 4, N. J.

Print No. Ins. 110 on Reader Service Card

"Teflon" Insulators for Transistor Leads

Four new styles of Chemelec transistor lead insulators are fabricated from Teflon TFE. The tough insulators are said to be corrosion-resistant and to withstand temperatures ranging from —100°F to 500°F.

MOSINEE MAKES MAGIC WITH PAPER

For quality laminates . . . Mosinee Saturating and Impregnating Papers

- These Mosinee papers give you precision control over quantity and rate of resin absorption.
- Mosinee saturating papers are made to your specifications.
- You'll get the exact penetration rate, degree of saturation, and resin pickup you desire.
- Apparent density as reflected by basis weight and caliper will be precisely as you have ordered.
- Quality will be uniform from roll to roll . . . from carload to carload . . . as long as you order.

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PAPER MILLS COMPANY
MOSINEE, WISCONSIN

FREE—DATA FILE AND PAPER TERMS DICTIONARY

Write Dept. IS-11

Print Ins. 47 on Reader Service Card

CHEMPRO TEFLON*
"INSULATION" GRADE
STOCK
ONLY HIGHEST QUALITY
ELECTRICAL GRADE POLYMER USED

You get better, longer lasting parts from Chempro Teflon "Insulation" Grade Stock. It is made from electrical grade TF-5 polymer. This pure, high quality material assures you a denser, more uniform Teflon for greater service life.

Chempro "Insulation" Grade Teflon is being used as connectors, inserts, spacers, wrappings in connection with standard and special high voltage, high frequency and high temperature electronic, electrical and military equipment.

Prices and deliveries quoted promptly. Write for Bulletin CP-554.

TAPE

Pressure-Sensitive Tape — Used as a Class H insulating tape. Available 0.0035", 0.006" and 0.013" thick, in standard widths from ½" to 2" in 18-yard and 36-yard rolls. A special 12" wide tape is now available by the linear yard.

Standard and Cementable Tapes — .002" to .005" thick in widths from ¼" to 24"; .006" to .096" thick in widths from ½" to 24".

TEFLON SHEETS

Standard sizes are 24"x24" and 48"x48"

THICKNESS (inches)	WEIGHT (lbs./sq. ft.)	THICKNESS (inches)	WEIGHT (lbs./sq. ft.)
1/16	0.75	½	6.00
⅛	1.5	¾	9.00
3/16	2.25	1	12.00
¼	3.00		

RODS

EXTRUDED — ¼" to 2" diameter in increments of 1/16", in lengths up to 12'.
MOLDED — 1⅛" to 2" diameter lengths up to 12", in increments of ⅛"; 2" O.D. and over in increments of ¼" in lengths from 6" to 12".

MOLDED CYLINDERS

2" O.D. and up with minimum wall thickness of ½" in increments of ¼". Maximum length is 12".

*duPont trademark

CHEMICAL & POWER
PRODUCTS, Inc.

11 Broadway, New York 4, N. Y.

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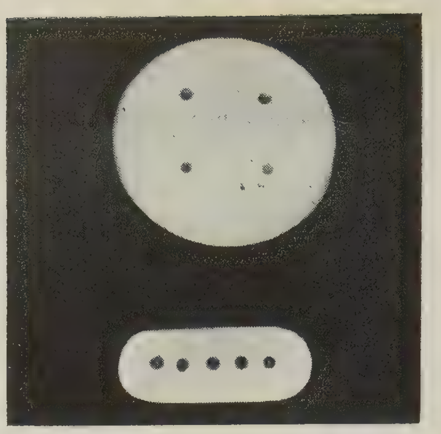


plus highly caustic environments. Other features claimed include zero moisture absorption, low loss factor (less than .0005), exceptional resiliency, and virtual immunity to shock and vibration damage. Garlock Electronic Products, Garlock Inc., Camden 1, N. J.

Print No. Ins. 111 on Reader Service Card

Flexible Printed Circuit Materials

Copper-clad unsupported "Teflon" and single-ply glass fabric Teflon grades have been developed for flexible printed circuit applications. Suggested applications include usage as computer circuits in ground support and airborne equipment. Moisture resistance, thermal stability, and low dielectric loss properties reportedly provide the designer with a superior material for flat cable and connector applications. Copper-clad unsupported Teflon grade, Di-Clad ST-1, is available in widths up to 18", lengths up to 42", and base thicknesses .003" to .060". The copper-clad glass fabric Teflon grades, Di-Clad 116T and 128T, are available in widths up to 36" and in lengths up to 42". Di-Clad 116T has a nominal base thickness of .005"; Di-Clad 128T has a nominal base thickness of .010". Continental-Diamond Fibre Corp., Newark 17, Del.

Print No. Ins. 112 on Reader Service Card

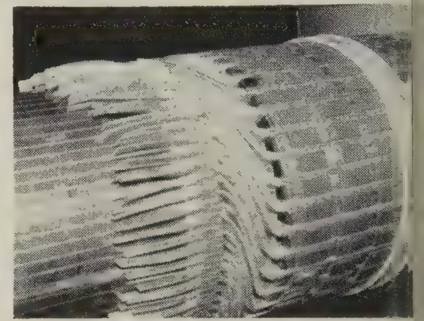
High Peel Strength Adhesive For Ceramics, Glass, Metals

New Hysol 10-001 is said to offer peel strength of 63.3 inch lbs on aluminum-to-aluminum, tensile shear strength of 3,300 psi, a 3-4 day pot life, and 45% elongation. This two component adhesive is recommended for bonding aluminum honeycomb panels, ferrous metals, ceramics, and glass. One-quart trial sample: $6.27. Technical bulletin A-401 availab Adhesives and Sealants Dept., Hy Corp., Olean, N. Y.

Print No. Ins. 113 on Reader Service Card

Edging Tape for Armature Banding

New resin-impregnated fiber gl tape with a thick edge serves as guide in applying fiber glass bandi tape to armatures by pre-establishi the width of the band and also p tects the edges of the completed ba from fraying and other damage. T use of this edging tape in conjuncti with fiber glass banding is said to i prove the appearance and quality the band. After cure, the edging ta and the banding tape fuse together one solid homogenous mass. Pit burgh Electrical Insulation Co., P. Box 10836, Pittsburgh 36, Pa.



Print No. Ins. 114 on Reader Service Card

Silicone Rubber for Molds And Encapsulating

A new room temperature setti silicone rubber for electrical encaps lation and mold-making is said demonstrate good resistance to epo phenolic, and polyester casting resi Better than average tear strength a ease of pourability are other cha acteristics reported. Pot life is abo 90 min after the addition of 10 hardener. The material, Elastom 108, is also stated to cure readily 75-80°F. Furane Plastics Inc., 45 Brazil St., Los Angeles 39.

Print No. Ins. 115 on Reader Service Card

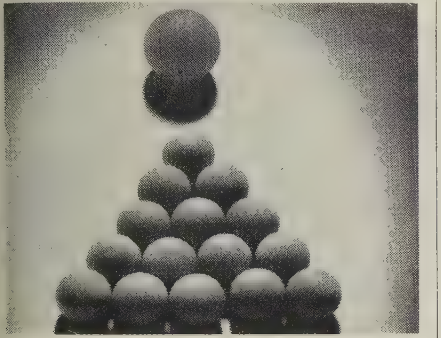
Polysulfide Potting Compound for 27

A new one-part, high temperatu resistant polysulfide potting co pound is known as Pro-Seal 729. Ph ical and electrical properties are sa to equal or exceed those establish by MIL-S-8516B. The potting co pound operates at prolonged ex sure at 275°F (135°C) with an lowable intermittent exposure 300°F (149°C). Limited portic may be used as required, the c

tridge or other container re-sealed and stored at room temperature for later use. Coast Pro-Seal & Mfg. Co., 2235 Beverly Blvd., Los Angeles 57.
Print No. Ins. 116 on Reader Service Card

"Teflon" Spheres Control Insulating Liquid Volume

Solid Teflon spheres may be used as spacer or filler material to inexpensively maintain a specified volume of liquid in a container. The spheres are particularly useful in applications where it is desirable to maintain a large volume of a relatively expensive liquid. Since most liquids deteriorate or evaporate over a period of time, the use of spacer spheres permits effective operations with smaller amounts of fluids. A typical application of the units to control volume is in oil filled circuit breakers and transformers. Teflon is used because of its excellent insulating properties, low dielectric constant, chemical inertness, and wide service temperature range. Garlock Electronic Products. Garlock Inc., Camden 1, N. J.



Print No. Ins. 117 on Reader Service Card

Close Tolerance "Teflon" Tubing

A new technique is claimed to allow the manufacture of Teflon tubing to close tolerances for high reliability. The new tubing is said to be 100% electrically tested for pin holes and other imperfections. Available in various sizes and colors and in spiral stripes. When bonding is required, the tubing can be "Tef-o-bonded." Cable Designs Inc., 66 Rushmore St., Westbury, L.I., N.Y.
Print No. Ins. 118 on Reader Service Card

Black Glass-Epoxy Laminate For Printed Circuits

New black NEMA grade G-10 "Textolite" plastic laminate is a colorfast, uniformly dense, black, glass-reinforced epoxy laminate for applications where attractive appearance

GUDELACE TAKES THE SLIPS OUT OF LACING

Try this simple test. Tie a piece of Gudelace around a pencil in a half hitch and pull one end. Gudelace's flat, nonskid surface grips the pencil—no need for an extra finger to hold Gudelace in place while the knot is tied!

Gudelace makes lacing easier and faster, with no cut insulation, or fingers—no slips or rejects—and that's *real* economy. Gudelace is the original flat lacing tape. It's engineered to *stay* flat, distributing stress evenly over a wide area. The unique nonskid surface eliminates the too-tight pull that causes strangulation and cold flow. Gudelace is made of sturdy nylon mesh, combined with special microcrystalline wax, for outstanding strength, toughness, and stability.

Write for a free sample and test it yourself. See how Gudelace takes the slips—and the problems—out of lacing.

GUDEBROD BROS. SILK CO., INC.

Electronic Division
225 West 34th Street
New York 1, N.Y.

Executive Offices
12 South 12th Street
Philadelphia 7, Pa.

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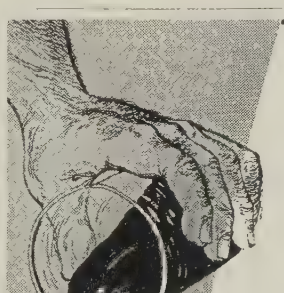

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FIRE RESISTANT EPOXY TREATMENT
for Electronic Applications

The **NEW**
RANDAC
SYSTEM **E-08**

Build fire safety into your electronic components by encapsulating with low-cost, easy-to-use MR E-08! Simple application at room temperature means that little or no experience is needed to embed your sub-assemblies, Class A coils, transformers, delay lines, and other products for longer life, more reliable performance.

System E-08 features:
• Fire resistance (self-extinguishing) • Fed. Spec L-P-406b Method 2021.1 • Good thermal conductivity • Room temperature cure • Low cost.

Mitchell-Rand engineers are available for technical assistance, consultation on epoxy materials and application problems.

MITCHELL-RAND
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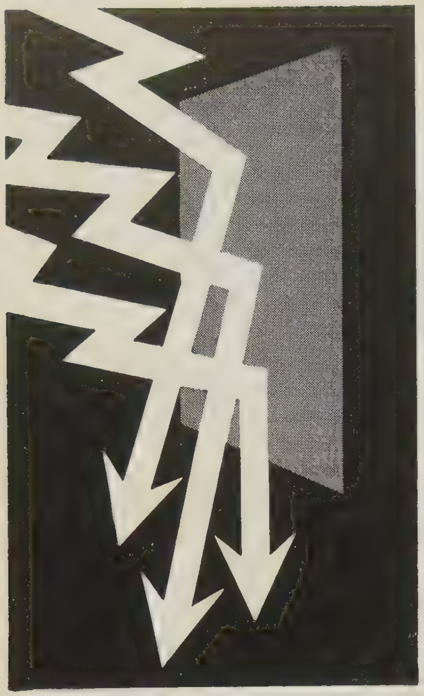
Specialists in Electrical Insulating Materials

Print Ins. 50 on Reader Service Card



improve
Dielectric Strength
with
WEST VIRGINIA
PRESSBOARD INSULATION

Three grades, each combining low cost with the higher dielectric strength a design engineer wants in insulation.

Made of 100% virgin kraft pulp *from our own pulp mill.* This assures uniform quality, no metallic particles.

PRESSITE: An absorbent, unsized board for air, oil, and askarel transformers and for capacitors. Natural kraft color. .031″ to .250″.

ELECTRITE: A hard board with high tensile strength. All punchings are clean and smooth. Sized with natural rosin to resist moisture. Available in brown or black. .031″ to .187″.

DENSITE: An extremely hard board with great tensile strength. Sized for moisture resistance or unsized for applications in oil. Natural kraft color. .031″ to .125″.

Ask for Underwriters Laboratories report #E3987. Write Board Products Sales, West Virginia Pulp and Paper Company, 230 Park Avenue, New York 17, New York.

WV West Virginia
Pulp and Paper

Print Ins. 51 on Reader Service Card

and high reliability are important. The material is stated to have the same electrical qualities, easy machinability, and mechanical strength as the standard translucent green G-10 Textolite material. Designated 11558A (copper-clad) and 11546A (unclad), the material is said to offer properties ideally suited to adverse temperature and humidity operating conditions. It reportedly has high insulation resistance, very low water absorption, and high stability in humidity. The copper-clad grade is designed to make printed circuits that take 30 minutes in boiling trichloroethylene, over 30 minutes in gold-cyanide solution, or 2 minutes in 500°F solder bath without blistering or bond failure. Bonding strength is described as superior. Laminated Products Dept., General Electric Co., Coshocton, Ohio.

Print No. Ins. 119 on Reader Service Card

One-Part Epoxy Adhesive Cures At Moderate Temperatures

New "Meta-Bond" 331 is a one-part, 100% solids, thixotropic, free-flowing epoxy adhesive which cures at moderate temperatures. Designed primarily for high-speed production use, it reportedly maintains a six-month minimum shelf life at room temperature yet cures in 150 minutes at 250°F or 15 minutes at 350°F. The material is said to bond metals, glass, ceramics, and most plastics. A volume resistivity of 10^{16} ohm-cm is expected to make it especially suitable for electronic applications. Other features reported include resistance to most acids, alkalies, and solvents; safe to use at —70°C to 175°C; and internal resiliency which prevents cracking from thermal shock. Mereco Products Div., Metachem Resins Corp., 530 Wellington Ave., Cranston 10, R. I.

Print No. Ins. 120 on Reader Service Card

Fibre Wedges Packaged In Reusable Cylinders

New square-formed (10 sizes) and curve-formed (11 sizes) fibre wedges are furnished packaged in sturdy red reusable cylinders. Each tube-pak contains 250 ft in convenient 36″ lengths. Tubes are wax coated inside, insuring freshness and proper moisture content. New package reportedly makes stocking easier and provides complete protection for contents. Complete Reading Electric Co., 100 S. Jefferson St., Chicago 6.

Print No. Ins. 121 on Reader Service Card

Sprayable or Paintable Silicone

Isochemcoat 1031 is a straight solvent solution of a silicone protective resin while 1031 MA is a mica filled modification for extreme high temperature work. The material is being used as a temporary adhesive for mica in capacitor assembly. It reportedly has excellent adhesion to ceramic, epoxies, silver, brass, copper, phenolics, aluminum, zinc, and steel. Isochem Resins Co., 221 Oak St., Providence 9, R. I.

Print No. Ins. 122 on Reader Service Card

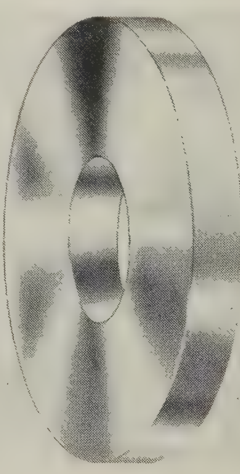
Gold Plated Conductors

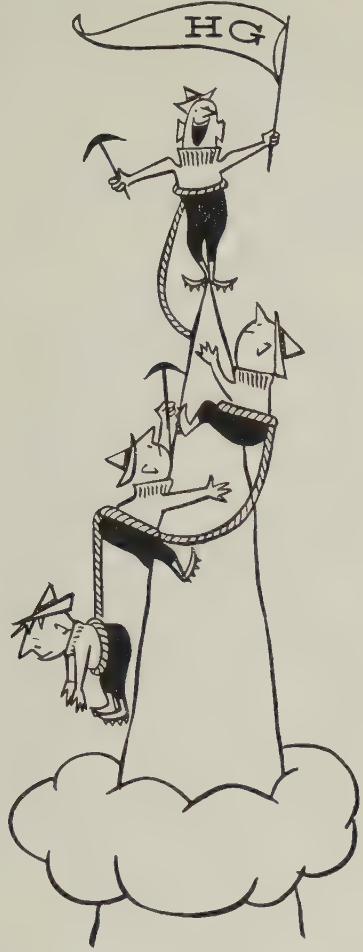
The extreme emphasis on reliability in the electronics industry today reportedly has caused increased concern over anticipated shelf life of components and materials. Over a period of time most conductors develop either a surface oxide or tarnish which renders the material less solderable. Gold plating can be used to eliminate this problem. Single end and stranded gold plated conductors are now available from Hudson Wire Co., Ossining Div., Ossining, N. Y.

Print No. Ins. 123 on Reader Service Card

Flat Nylon Washer for Insulating, Spacing, Cushioning

A new flat nylon washer is said to be ideal for use as a spacer or as an insulator and can be used on any screw, bolt, pin, nail, or rivet. Because of the low coefficient of friction of nylon against metals, these washers provide inexpensive bearings that require no lubrication. The wash-





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the finest in Fiberglas* electrical tape—
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ELECTRICAL INSULATION SUPPLIERS
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INSULATION MANUFACTURERS CORP.
1231 Superior Avenue, N.E.

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Division of McGraw-Edison Co.

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SUMMERS ELECTRIC COMPANY
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INSULATION MANUFACTURERS CORP.
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Blackwood's Division
3609 East Olympic Blvd.
WESTERN FIBROUS GLASS PRODUCTS CO.
4423 Fruitland Avenue

MILWAUKEE, WISCONSIN
INSULATION MANUFACTURERS CORP.
2040 West Wisconsin Avenue

NEWARK, NEW JERSEY
ROBERT McKEOWN COMPANY INC.
99 Dorsa Avenue, Livingston

NEW YORK, NEW YORK
MITCHELL RAND MFG. CORP.
Insulation Division, 51 Murray St.

PHILADELPHIA, PA.
EARL B. BEACH COMPANY
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PITTSBURGH, PA.
EARL B. BEACH CO.
Verona & Mt. Carmel Rds.

PITTSBURGH, PA.
INSULATION MANUFACTURERS CORP.
535 Smithfield Street

SAN FRANCISCO, CALIFORNIA
WESTERN FIBROUS GLASS PRODUCTS CO.
739 Bryant Avenue

SEATTLE, WASHINGTON
WESTERN FIBROUS GLASS PRODUCTS CO.
1915 First Avenue S.

ST. LOUIS, MISSOURI
WHITE SUPPLY COMPANY
4343 Duncan Avenue

Horace Linton Division
HESS, GOLDSMITH & CO., INC.
1400 Broadway, New York 18, N. Y. A Division of Burlington Industries
Makers of Quality Fiberglas Tapes...including HESGON

Burlington
QUALITY ®

*T.M. Reg. U.S. Pat. Off. O-CF Corp.

Print Ins. 52 on Reader Service Card

ers can also be used to prevent corrosion as the nylon insulates dissimilar metals. The natural resilience of nylon enables the washer to absorb shock and vibration. The washers are claimed to be excellent for use in making fastenings to highly finished porcelain or ceramic materials because the washer cushions the pressure of the fastener and permits it to seat to the required tightness without cracking, chipping, or crazing of the surface. Nyltite Corp. of America, 280 Badger Ave., Newark 8, N. J.

Print No. Ins. 124 on Reader Service Card

All-Vinyl Cable Markers

Identification of large cables, power supply lines, and heavy duty wiring harnesses reportedly is simplified with new, self-sticking vinyl-plastic cable markers. The ½″ x 3½″ markers are used to identify cables, extra large wires, and conduits up to 1″ in diameter. They are also used to mark and band wires in wiring harnesses and multiwire circuits. Because of the elasticity of the 6-mil insulating vinyl material, the markers can be "stretched" around groups of wires, providing a tighter, neater, and less space-taking installation. This is particularly important when circuits or harnesses to be marked are for electronic equipment where space is at a premium. Each marker is printed continuously with a bold, easy-to-read, black on white numeral or letter for full, round the cable identification. Markers are mounted on a handy (4″ x 9″) dispenser card, ready for instant use. Free sample. W. H. Brady Co., Dept 594, 727 West Glendale Ave., Milwaukee 9, Wis.

Print No. Ins. 125 on Reader Service Card

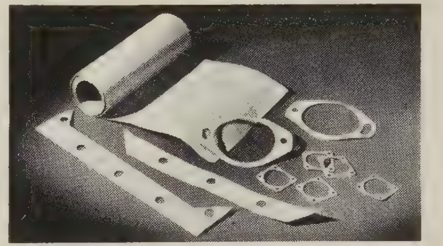
Hermetic, Porcelain-to-Metal Sealed Bushings for High Voltages

A new line of hermetic, high voltage porcelain-to-metal sealed bushings are designed for use in high reliability capacitors and electronic and distribution transformers. The metal parts of these bushings are bonded directly to the porcelain. The assemblies are said to be mechanically strong, high vacuum tight, and capable of continuous operation at up to 200°C. Ceramaseal Inc., New Lebanon Center, N. Y.

Print No. Ins. 126 on Reader Service Card

Maximum RF Shielding and Positive Sealing Gaskets

Cohrlastic conductive gasketing is available in two types, No. 8516 and No. 8520 which are 30 and 24 mesh aluminum alloy wire cloth impregnated with a 50 durometer silicone rubber to a thickness of 0.016″ and 0.020″. This construction provides a material which is said to withstand temperatures from —65 to 500°F (—53.9 to 260°C). It is stated to conform easily to irregular surfaces and to be impervious to fluids. The material is recommended for use where a conductive material is needed between two metal surfaces to allow the flow of electrical current while restricting or filtering any induced radio frequency. It is suited for wave guide gasketing, for shielding between magnetos and their bases, in ignition harnesses, in quick disconnect plugs, in telecomputing equipment, etc. The Connecticut Hard Rubber Co., 407 East St., New Haven 9, Conn.



Print No. Ins. 127 on Reader Service Card

Cable Accessory Kits for Terminations and Seals

Recently developed epoxy-"Orlon" cable accessory kits consist of special packaging of Orlon tape and a specialized epoxy-resin formulation. They are used for making indoor and outdoor potheadless terminations on paper-lead cable in the 5 kv range; for making indoor potheadless terminations in the 15 kv range; and for making hermetic seals on pothead terminations to 35 kv. The kits may also be used for making cable sheath and accessory repairs. The new terminations and seals reportedly appear to offer significant cost reductions and simplified installations. The Epoxylite Corp., 1428 North Tyler Ave., South El Monte, Cal.

Print No. Ins. 128 on Reader Service Card

Metalized Ceramic Terminals For High Voltages

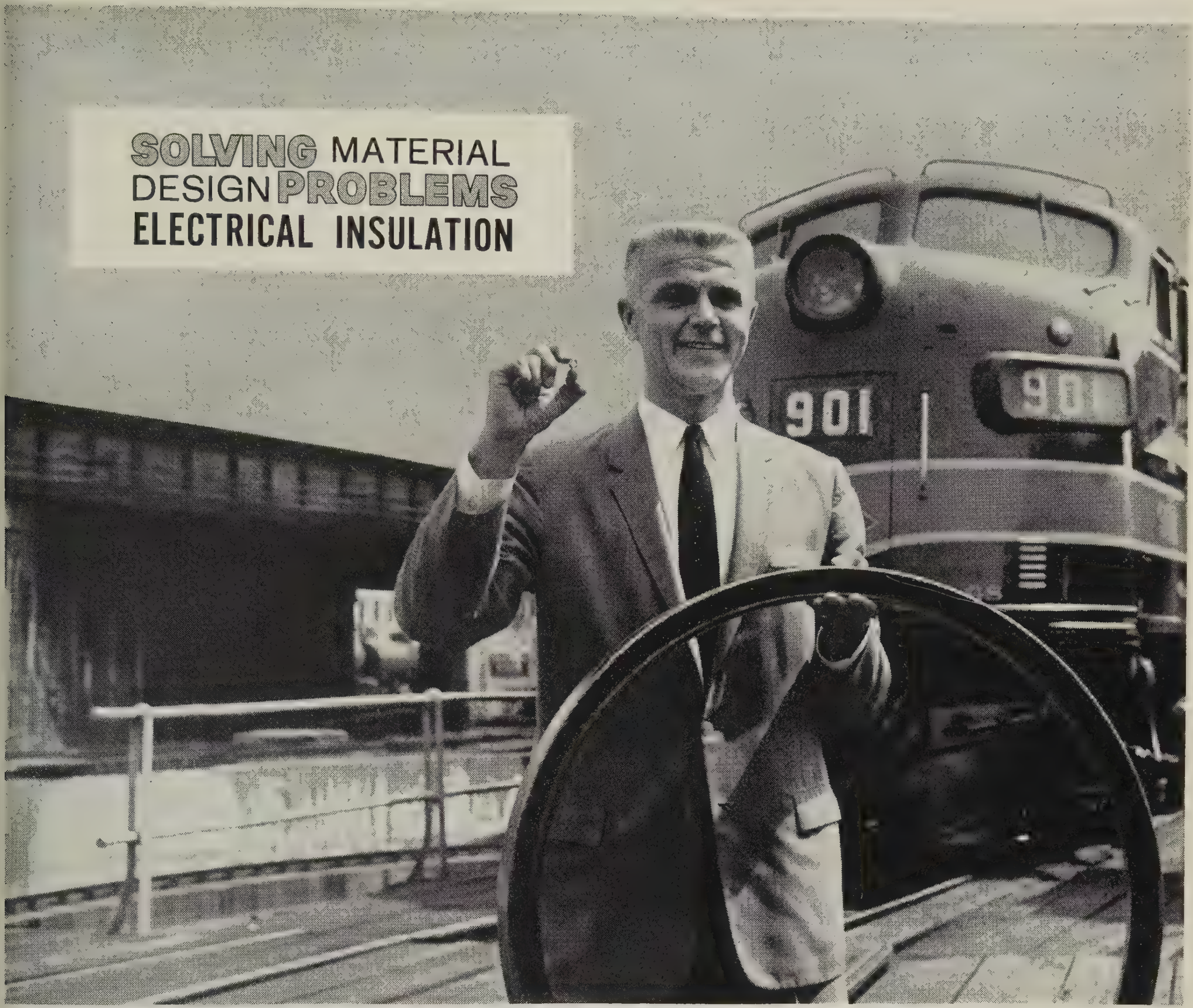
New L-series line of standard-sized, high voltage, metalized ceramic terminals reportedly have ratings as high as 15,000 v. and meet JAN 1-8 and JAN 1-10 specifications. The metalized ceramic terminals are stated to allow manufacturers of electronic equipment, such as transformers and capacitors, to efficiently make electrical connections at high voltages and still maintain hermetically sealed units. The L-series consists of 4 terminal types in 26 different sizes. The ceramic is a glazed steatite with the metalized portion a silver fired coating which has been hot tinned for soldering. The coating will withstand 450°F for 1½ min. Metalizing Industries Inc., 338 Hudson St., Hackensack, N. J.

Print No. Ins. 129 on Reader Service Card

Insulated Wire Shielded By New Process

Insulated wire shielded by a new process reportedly costs less to manufacture, can be produced in unlimited lengths, and in wire sizes beyond the range of other shielding methods. The new shielding process consists of forming metallic tape of any desired thickness and up to 8000 ft in length in a continuous process into a tube around the insulated wire. The joint in the tube is then arc welded and the welded joint and the tube are "cold-worked" until a gas and water tight cylindrical tubing which closely fits

SOLVING MATERIAL DESIGN PROBLEMS ELECTRICAL INSULATION



From a cool shave to continuous heat. CDF MICABOND® insulation solved two problems: low cost for tiny commutator V-rings in electric shavers . . . continuous heat in traction motor and generator V-rings and segments for diesel locomotives.

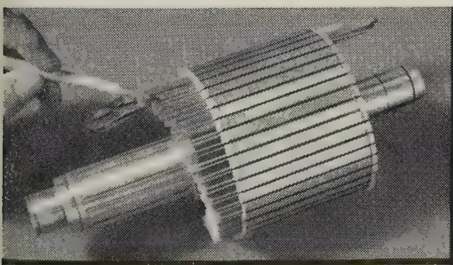
You get the exact physical and electrical properties you want at low cost when you have a wide selection of grades to choose from, plus engineering know-how to help you with your selection.

The many grades and types of MICABOND made it comparatively easy to solve the different insulation problems posed by low cost shaver motors and rugged locomotive traction motors and generators.

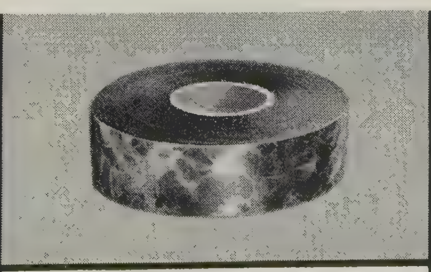
In addition to the MICABOND line, CDF makes the industry's widest range of laminated plastics, vulcanized fibre, and other electrical insulating materials. For MICABOND information, write us for catalog M-59. For other product information, ask for General Folder 60. Or check your Sweet's Product Design file.

CONTINENTAL-DIAMOND FIBRE

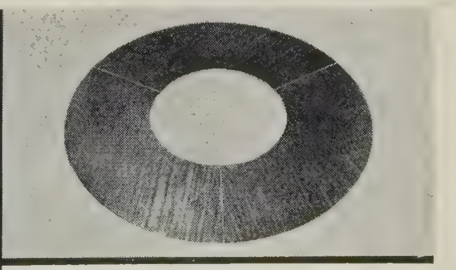
A SUBSIDIARY OF THE Budd COMPANY • NEWARK 17, DEL.
In Canada, 46 Hollinger Road, Toronto 16, Ont.



Long-life insulation. CDF MICABOND is used in low-cost slot cell insulators in motor assemblies.



Flexible. CDF MICABOND tapes provide high heat resistance for many types of electrical windings.



Impact resistance. A reason why MICABOND was used as disc insulators for giant magnetic cranes.

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COTTON TAPES AND WEBBINGS
natural-dyed-purified

COLORED INSULATING YARNS
soft or glaze finish

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CO.

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WINSTON-SALEM, N. C.
P.O. Box 1400

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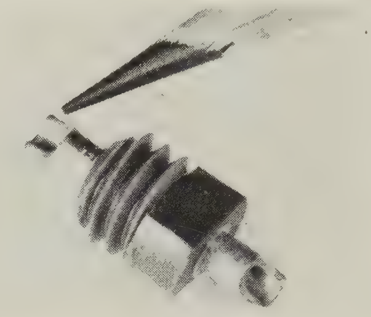
Print Ins. 54 on Reader Service Card

around the insulated wire is produced. Long continuous lengths of insulated wire have been shielded by this process using pure aluminum with a wall thickness of 0.010″. Flexibility is claimed to be satisfactory. Electrarc Inc., Suite 301, 20 Pemberton Square, Boston 8, Mass.

Print No. Ins. 130 on Reader Service Card

Miniature Feed-Thru Terminal with Integrally Molded Threaded Body

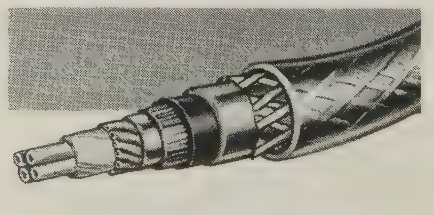
A new feed-thru terminal secures directly to panel assemblies by means of an integrally molded threaded body. Flats which are also part of the integral mold reportedly make it easy to insert the threads into an assembly with either an automatic or manual coupling drive. Identified as part No. 3FT3, this special terminal is available with body material of melamine or diallyl phthalate in accordance with military specifications. Whitso Inc., IN-2 Byron St.. Schiller Park, Ill.



Print No. Ins. 131 on Reader Service Card

Waterproof Tow Cable Does Not Kink

Underwater armored tow cable used to support sonar, target buoys. and submarine research gear has a flat, flexible, stainless steel braid that does not kink and which is designed for breaking strengths up to 3,000 lbs. Twenty conductors transmit signals of all types and levels. and also permit control of the underwater unit from surface vessels or aircraft. A neoprene jacket reportedly makes this cable watertight and abrasion resistant. Boston Insulated Wire & Cable Co., 65 Bay St., Dorchester, Mass.



Print No. Ins. 132 on Reader Service Card

Branded Wire Markers

New markers for circuit identification consist of vinyl plastic tubing in sizes ranging from .027″ ID to 3/8″ ID branded with whatever information is required. The information can be ever-changing or repeating. The branded wire markers are claimed to be the quickest and most inexpensive method of permanently identifying a circuit. Floy Tag & Manufacturing Inc., 2909 Blakeley St., Seattle 5 Wash.

Print No. Ins. 133 on Reader Service Card

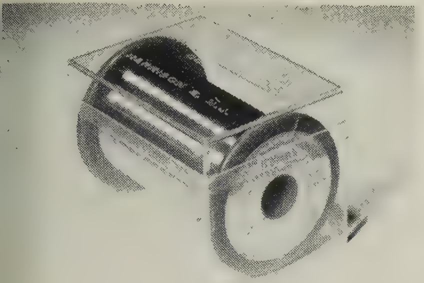
Fog-Type Insulators for Use in Areas of Heavy Contamination

A special purpose fog-type suspension insulator is designed for use in areas of heavy contamination where natural cleaning is inadequate and artificial cleaning must be used. Identified as "California" fog-type suspensions, the new units are rated at 15,000 lbs M&E strength and are available for ball-socket or clevis-eye mounting in $5\frac{3}{4}''$ and $6\frac{1}{2}''$ spacing units. The new triple petticoat design provides 18″ of leakage distance. The deep-cut, gently curved corrugations reportedly catch the wash water and swirl it around the insulator, flushing and cleaning the entire surface. The assembled units reportedly are cleaned hot—quickly, thoroughly, and economically with a stream of water directed from a single position. Insulator Div., Lapp Insulator Co. Inc., Le Roy, N. Y.

Print No. Ins. 134 on Reader Service Card

Rigid Plastic Box Protects Spooled Fine Resistance Wire

Fine wire sizes of resistance alloys are now shipped packed in an improved type of clear, rigid plastic container. Molded of a high impact resin to withstand rough usage, this transparent container permits fast visual inspection and identification. Other advantages claimed include

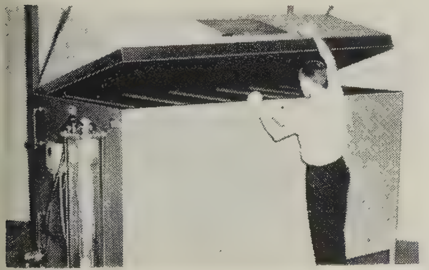


complete protection of wire and spool against dust, dirt, and corrosion; efficient shelf stacking because of the square shape; easy withdrawal of spool and repacking of partially used spool; and after-use utility of the empty container for other items. Driver-Harris Co., Harrison, N. J.

Print No. Ins. 135 on Reader Service Card

King-Size Corrosion-Test Cabinets

Extra capacity and high-accuracy for corrosion-testing bulky specimens, assemblies, and quantity (batch-type) testing with all atmospheres is said to be provided by a new line of "King-Size" G-S accelerated corrosion test cabinets. They reportedly meet ASTM and U. S. Government specifications. Operating currents are 110 v or 220 v single phase/3.5 kw (optional), 220 v, 440 v, or 660 v/3 phase/with 110 v control. Test chamber of model shown is 96" x 48" x 48" deep ID. Test results are claimed to be always within 10% of absolute duplication. Also featured are uniform heating by full-coverage water jackets on all four sides and bottom; high test-heats (up to 150°F); temperatures held to ± ½°F; test chamber free of all metal parts or other contaminating materials; "Plexiglas" window; a counter-weighted opening device on lid; and a removable salt reservoir and cover for all types of environmental testing. G. S. Equipment Co., 15583 Brookpark Rd., Cleveland 35, Ohio.



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Insulating Oil Dielectric Tester

A light, portable unit for on-the-

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Chemical Engineer or Chemist with advanced degree or its equivalent in practical experience to develop and apply new and improved materials and processes for diverse line of built-up mica and flexible electrical insulation products. Applicant should have a background in synthetic resins and a record of demonstrated ability of accomplishment indicating creativity and a capacity to develop new ideas into useful products. The position offers opportunity to conduct independent research in a new central research laboratory.

PROCESS ENGINEER

Chemical Engineer or Chemist to assume diversified assignments in the production of mica tapes, sheets, and molded parts. General responsibilities will include maintenance of process specifications, insuring product quality and implementing the transfer of new products from R & D to Production. Applicant must be familiar with natural and synthetic resins, molding techniques, and manufacturing processes involving hydraulic presses and treating equipment.

Locale is pleasant University town in Northern Delaware with fine schools, excellent housing. University facilities immediately available for graduate work. Send complete details of experience, background, and salary requirements to:

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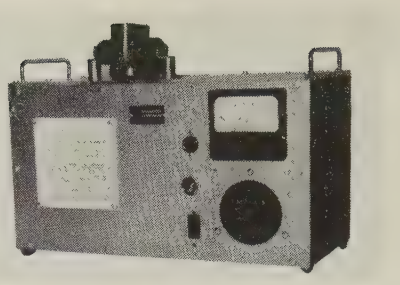
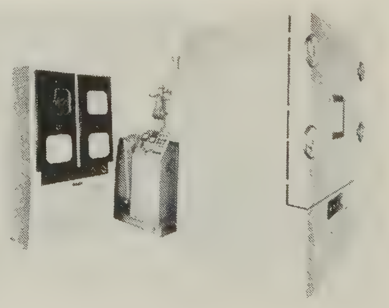


spot dielectric testing of transformer oil, "Pyranol," and other insulating liquids is said to meet requirements of ASTM and Mil Specs. Model K35-2-OC features a continuously variable output of 0 to 35 kv rms at 2 kva capacity; operation from ordinary lighting circuits of 110 v, 60 cycles; metering directly at oil cup for greatest accuracy; easily removable oil cup; simplified control circuitry for easy operation; a fast, trip-free, manual reset circuit breaker that de-energizes the HV when sample breaks down; 4½″ square kv meter with linear scale; and a 3-conductor input cord with safety grounding plug. Optional motorized output control is available to increase test voltage at 3 kv per second as recommended by ASTM specs. Cabinet measures 21″ × 9″ × 12″. Weight is approximately 70 lbs. Price is $625. Peschel Electronics Inc., R. F. D. No. 1. Patterson, N. Y.

Print No. Ins. 137 on Reader Service Card

Environmental Test Chamber

A new environmental chamber simulates space conditions up to 500.000 ft. Model WF-27-125+350 has an adjustable temperature range from —125°F to +350°F. Pull down over the entire range requires 90 minutes, while heat up takes 60 minutes. The cooling system employs an ASME certified cascade system, along with six other patented features. A combination of cold wall and air circulation simulates true high altitude conditions. Special vacuum equipment simulates 4 × 10^{-6} mm of mercu in 45 minutes. Inside dimensions the chamber are 36″ × 36″ × 36 Controls and recorders, along wi temperature and altitude ranges, c be adapted to meet individual requir ments. Webber Manufacturing C Inc., P. O. Box 217, Indianapolis Ind.



Print No. Ins. 138 on Reader Service Card

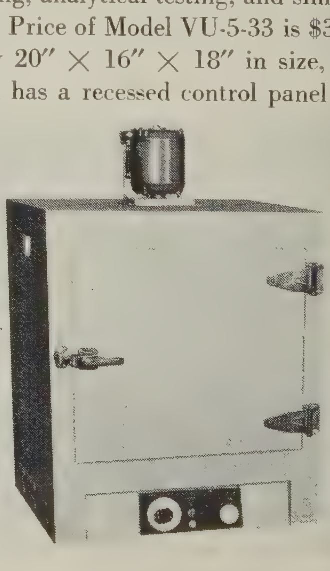
Crimping Tool for Terminals and Connectors

A lightweight tool for crimpin electronic terminals and connecto the "Pneudraulic" crimping tool said to produce a consistently unifor crimp which withstands extreme pu tests. It is designed for use on pr cision cable and connector assem lines. Equipped with standard d sets (special dies also available), th tool operates on a power-air-filtere line of 90 psi minimum. Electroni Accessories Inc., 734 So. Lawrenc St., Los Angeles 21.

Print No. Ins. 139 on Reader Service Card

Compact Lab Oven For Use to 500°F

A compact new laboratory ove utilizing forced convection provide automatic control over a three-hea range up to 500°F max. It is de signed for chemical drying, plasti curing, sterilization, aging, finish baking, analytical testing, and simila uses. Price of Model VU-5-33 is $330 Only 20″ × 16″ × 18″ in size, th oven has a recessed control panel fo



access to instruments and clear visibility. Its ¼-hp blower motor is rubber-mounted atop the case, and drives air down side ducts and up through the heater in the base. Bulletin 203-10 available. Despatch Oven Co., 619 SE Eighth St., Minneapolis, Minn.
Print No. Ins. 140 on Reader Service Card

Automatic Armature Winding Machine

A new, hydraulically controlled, automatic armature winder is claimed to be an extremely versatile unit capable of handling armatures of diameters from ½″ to 2½″ and lengths up to 3¼″. A simple push button control starts the automatic winding and commutator hook-up cycle. Operators reportedly can be trained in one day. Winding speed up to 3000 rpm is actuated by a single control knob, and the machine is made fully automatic by a hydraulic pump unit with variable volume and pressure. Winding speed is controlled in medium and low speeds by heavy industrial flow controls which are pressure and temperature compensated. Possis Machine Corp., 1645 Hennepin Ave., Minneapolis 3, Minn.
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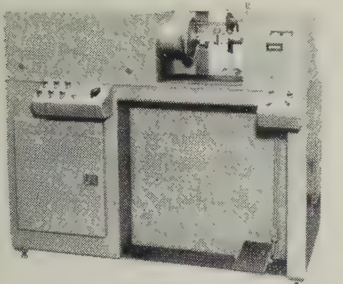
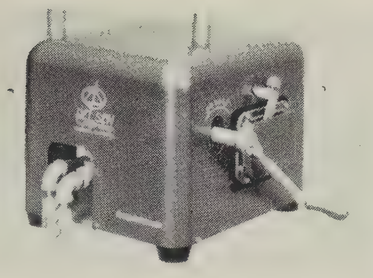


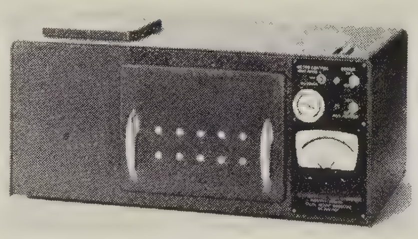
Two-Part Liquid Resin Dispenser With Wide-Range Variable Ratio

The new model 395 variable ratio resin dispenser is said to provide great flexibility in metering two-component liquid resin systems. By means of a simple lever adjustment, the ratio of resin to hardener can be varied from about 20:1 to 1:1. Other features reported include rapid change from one resin-hardener system to another, changes in resin-to-hardener ratio readily made in order to compensate for changes in ambient temperature, a reference scale so that ratios may be accurately reset, and provision for locking to prevent unintentional changes in the resin-to-hardener ratio. Unit dispenses a reproducible ratio of resin to hardener and is equipped with drip-proof outlet valves. Available in both hand operated and motor driven models. Delsen Corp., 719 W. Broadway, Glendale 4, Cal.
Print No. Ins. 142 on Reader Service Card



Portable Temperature Chamber

Model 1060L portable temperature chamber is heated by electric elements and cooled either by liquid CO_2 or dry ice. To cool with liquid CO_2, the user merely connects the chamber with fittings provided to a syphon bottle of liquid CO_2, then dials his selected temperature. A sensitive meter-relay and thermocouple reportedly control temperature within ±½°F anywhere in the range of −100°F to +500°F. Overshoot or undershoot when approaching a temperature setting is said to be eliminated by the control circuitry. A centrifugal blower assures temperature uniformity throughout the test space. Test volume is 10″ × 7″ × 7″, accessible through a convenient drawer containing 10 sleeves for test leads. The unit operates on 117 volts a-c and can be programmed with an auxiliary timer to alternate between a high and a low temperature. Delta Design Inc., 7460 Girard Ave., La Jolla, Cal.
Print No. Ins. 143 on Reader Service Card



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HIGH VOLTAGE

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376°C.

This is the heat distortion value on grade HH Insulstruc as per ASTM D-648-56 264 psi.

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Grade HH is recommended as an economical substitute for glass silicone in certain applications at 400°F.

Also ask for free catalog of six standard grades of Insulstruc laminates.

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Polyester Resin Insulation

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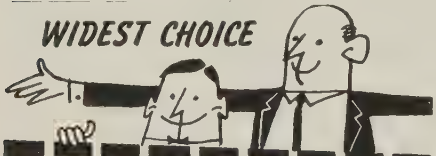

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New Literature

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Silicone Tubing and Sleeving Brochure

New brochure describes and illustrates properties of glass braid tubings and sleevings coated with either silicone rubber or silicone resin. Charts list details of size, packaging, wall thickness, telescoping, minimum performance specifications, and colors. 4 pages. Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago 6.

Print No. Ins. 201 on Reader Service Card

Technical Ceramic Brochure

A new brochure on precision ceramic products for the research frontier industries contains suggestions to designers of ceramic products, as well as picturing and describing techniques of ceramic fabrication. It features a properties chart and covers general characteristics of ceramic materials which make them desirable for application to industrial requirements. Technical Ceramic Div., Gladding McBean & Co., 1551 S. Primrose Ave., Monrovia, Cal.

Print No. Ins. 202 on Reader Service Card

Plastics Properties Chart And Price List

Chart of plastic materials contains electrical, chemical, physical, and other properties of 21 thermoplastic materials and 20 thermosetting materials. Minimum prices, trade names, and color possibilities are included for each material. 2 pages, 21⅜" × 11". Tech-Art Plastics Co., P. O. Box 739, 111 Ridgedale Ave., Morristown, N. J.

Print No. Ins. 203 on Reader Service Card

Property Chart for Flame-Retardant Plastics

A new property chart, 11" × 13"
lists electrical, structural, thermal an
other data on regular and flame-re
tardant diallyl phthalate and diall
isophthalate plastics. This is said to b
the first time that all versions of flam
retardant diallyl phthalate and diall
isophthalate have been tabulated. Th
chart should be of special interes
to companies engaged in work o
computers, missiles, etc., where flam
retardant diallyl phthalates are no
being specified. All applicable mil
tary specifications are listed. Me
Plastics Co., 12270 Nebraska Av
Los Angeles 25.

Print No. Ins. 204 on Reader Service Card

Booklet Describes Silicone Uses in Aircraft and Missiles

"Silicones Solve Space Age Prob
lems" is the theme of a new referen
describing a few of the many esta
lished applications for silicones i
military and commercial aircraft, i
missiles, and in ground support equi
ment. More than 25 applications a
detailed and illustrated. Reasons wh
silicones have become such basic an
vital materials are outlined. Silicon
fluids, rubber, potting material
sealants, and protective coatings a
covered. 8 pages. Dow Corning Cor
Midland, Mich.

Print No. Ins. 205 on Reader Service Card

Catalog and Price List of Plastic Sheet, Rod, Tubing, Film, Etc.

Newly revised catalog of plast
sheets, rods, tubes, films, blocks, a
flat tubings lists price reductions
up to 10% on some varieties of pla
tics. Cements, pigments, and misc
laneous supplies also are include
The catalog lists available siz
weights, color ranges, textures, pu
chasing specifications, grades a
prices. It includes a revised and

NOMINAL WEIGHTS OF FINISHED WEATHER-RESISTANT WIRE AND CABLE

(Pounds per 1000 Feet)

Conductor Size AWG or Mcm	Copper & Copper Alloy Conductors: URC Type Double Braid	Copper & Copper Alloy Conductors: URC Type Triple Braid	Copper & Copper Alloy Conductors: Neoprene Type	Copper & Copper Alloy Conductors: Polyethylene Type	Aluminum Conductors: Neoprene Type	Aluminum Conductors: Polyethylene Type
Stranded						
2	246	270	248	230	105	87.4
4	155	170	163	143	73.3	53.3
6	103	115	108	91.5	51.5	35.0
Solid						
2	239	260	232	219	92.2	79.2
4	151	164	152	136	64.0	48.0
6	100	112	101	87	45.7	31.7

Sources: American Standards Association Specifications

This table shows

POLYETHYLENE covered line wire weighs less

Because it's the lightest, polyethylene-covered line wire is the easiest for linemen to string up . . . hardest for ice and snow loading, gale-force winds to bring down.

Polyethylene-covered line wire, depending on size and conductor, weighs from 5% to 32% less than other types. That's what the figures in the specifications tabulated above show.

This, of course, is no news to linemen who have strung all types of weatherproof line wire. They may not be able to quote pounds and percentages, but they all know you can't beat polyethylene on weight.

Linemen's Favorite Material

Light weight means easy handling, one of the main reasons polyethylene rates tops with installation crews. They also like polyethylene wire because it's clean . . . free-stripping . . . has a smooth, self-lubricating surface that almost makes pulling a pleasure. And despite the exterior slip, the plastic covering hugs the conductor tightly, doesn't ruffle as it goes over crossarms.

"Built-in" Safety Factor

Polyethylene's lightness provides lasting mechanical advantages, since span loads don't tax supports as much as heavier type wire. This "built-in" weight safety factor pays off when violent storms push aerial construction to strain limits . . . when ice and snow loads topple heavier lines.

An added factor in polyethylene wire's ability to stay up under adverse conditions is its smaller diameter. It offers less resistance to wind, a smaller surface for ice build-up.

Winning Combination

Called the "closest to the ideal covering for line wire," polyethylene is outstanding in other respects too. The shield it forms over wire is continuous . . . tough . . . resistant to aging, weathering, moisture, abrasion by lashing branches. It's good for decades of superior service marked by fewer outages, minimum maintenance.

When you order covered wire and cable, make sure the coating is made with PETROTHENE® polyethylene resins. PETROTHENE polyethylene costs no more, but it gives you premium weather and stress-crack resistance.

Polyethylene's advantages are outlined in an informative new U.S.I. data sheet, "Polyethylene . . . The Best Line Wire Covering." Also available is a data sheet showing properties, applications and specifications of PETROTHENE polyethylene compounds. Send for your copies today.

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Division of National Distillers and Chemical Corp.
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☐ "PETROTHENE Resins for the Wire and Cable Industry"

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50,000 Volt DC HV Test Set

- Small size, light weight
- Rugged & reliable
- Low cost

Model S50-5DC is designed for dielectric testing, for leakage current measurements at high-voltage, and also used as a high voltage power supply for CRT work, electrostatic processes, sparking, corona generation, etc.

The oil-filled tank, less than 1 cu. ft. in volume, contains all HV components, metering facilities and automatic output shorting solenoid.

Selenium rectifiers are employed for ruggedness, long life and enhanced reliability. HV terminates in a shielded cable.

A fully instrumented control panel in cabinet or for rack mounting, not shown, provides all safety and convenience features.

The HV section pictured also available by itself without the control cabinet for use as a power unit.

Many other models available.

Telephone or write.

Peschel Electronics, Inc.
Phone TRinity 8-3251
Towners Patterson, N.Y.
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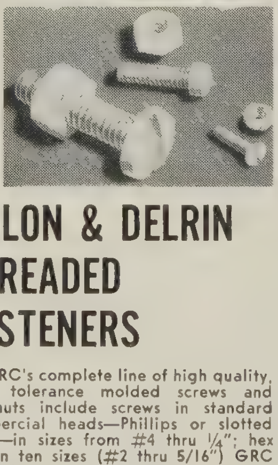

NYLON & DELRIN THREADED FASTENERS

- GRC's complete line of high quality, close tolerance molded screws and hex nuts include screws in standard commercial heads—Phillips or slotted types—in sizes from #4 thru ¼"; hex nuts in ten sizes (#2 thru 5/16") GRC molded miniature machine screws—half the weight of aluminum—in sizes as small as #0 make more compact designs possible. GRC's single cavity molding technique adds exceptional uniformity, accuracy, economy to Nylon's & Delrin's high strength-to-weight ratio, built-in electrical insulating qualities, stability, resilience and elasticity. GRC's molded fasteners are available from stock in a wide range of types, sizes and lengths.

WRITE, WIRE, PHONE NOW for samples & GRC's new detailed Industrial fastener catalog.

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Phone: NEw Rochelle 3-8600

Print Ins. 63 on Reader Service Card

panded two-page comparison table of chemical, electrical, and mechanical properties of 14 plastics families. 64 pages. Cadillac Plastic & Chemical Co., 15111 Second Ave., Detroit 3.

Print No. Ins. 206 on Reader Service Card

Bulletin on Plastics Professional Groups

New bulletin, titled "Professional Activity Groups—Your Opportunity to Grow Professionally in Plastics," outlines the function, advantages, organization, and operation of PAG's in the Society of Plastics Engineers in general. It also indicates the scope and gives a brief summary of activities of each of the 15 currently organized groups. 15 pages. Society of Plastics Engineers Inc., 65 Prospect St., Stamford, Conn.

Print No. Ins. 207 on Reader Service Card

Booklet on PTFE Electrical Insulations

New booklet describes "Irvington" brand polytetrafluoroethylene insulating materials—films, coated glass cloths, and tubings. It features charts of typical properties of the various products. 4 pages. Dept. WO-389. Irvington Div., Minnesota Mining and Manufacturing Co., 900 Bush Ave., St. Paul 6, Minn.

Print No. Ins. 208 on Reader Service Card

Bimonthly Bulletin of News And Views for Engineers

The "SPECtator" is a new bimonthly bulletin of news and views conceived as a service to engineers and engineering executives. It will be published six times a year, in handy pocket size (3¾" × 8½"). 8 pages. The M & T Co., 2 Penn Center Plaza, Philadelphia 2, Pa.

Print No. Ins. 209 on Reader Service Card

Booklet on Acetone Solvent And Chemical Intermediate

A new technical booklet, NS-277, contains data on acetone, a high purity solvent and chemical intermediate. Information in the booklet includes data on specifications and typical analysis, sales information, properties and chemistry, and a partial list of uses for acetone. The section on chemistry includes a few of the specific general types of reac-
tions which the acetone is capab
of undergoing. 12 pages. Hercul
Powder Co., Wilmington 99, Del.

Print No. Ins. 210 on Reader Service Card

Brochure on Procedures of Contract Research

The first in a series, this brochu
describes in a step-by-step manner t
relationship existing between t
client and the research institute, b
ginning with the initial meeting
the two parties and progressing b
yond the successful completion of
specific project. 6 pages. Publicatio
Office, Battelle Memorial Institut
505 King Ave., Columbus 1, Ohio.

Print No. Ins. 211 on Reader Service Card

Manual on Silicone Defoamers

New manual, "The ABC's of D
foaming," covers many uses of si
cone antifoamers and defoamer
Many applications are illustrated.
pages. Dow Corning Corp., Midla
Mich.

Print No. Ins. 212 on Reader Service Card

Catalog of High Temperature Wire and Cable

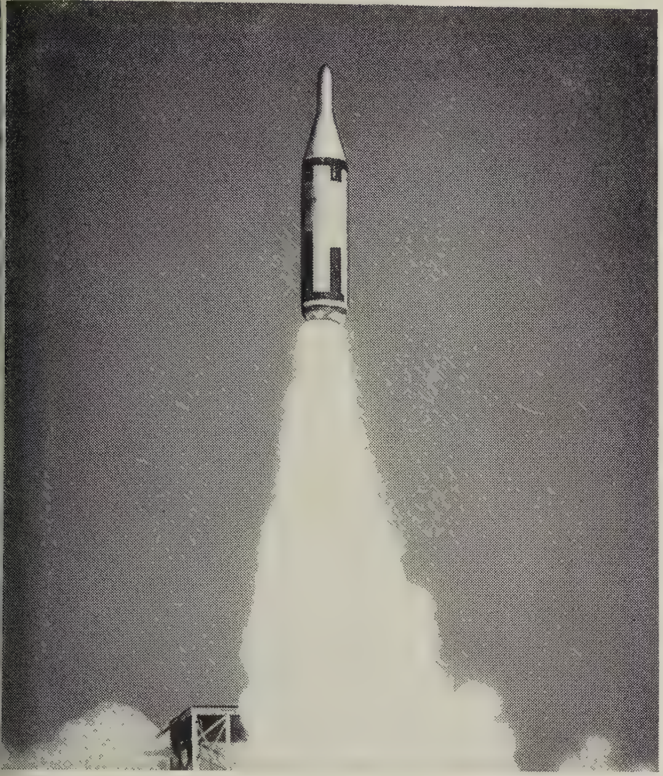
A new catalog contains phot
graphs of various departments a
operations of a manufacturer of hi
temperature wire and cable, explai
the services offered, and lists tabl
for help in ordering. 32 page
Thermal Wire of America, Keeler
Bay, South Hero, Vt.

Print No. Ins. 213 on Reader Service Card

Wire Striping Guide

Designed to help the engineer dra
up color-coded wire specifications,
new brochure covers several are
of wire striping and lists the 1
clearest military-approved color co
binations, along with the color co
binations which should most seriou
be avoided. Another feature of t
brochure is a chart which brea
down the two most commonly us
military specifications covering ho
up wire (MIL-W-76A and MIL-
16878C). The chart relates the mi
tary part number to physical co
struction, temperature rating, co
ductor size, stranding specificatio
and voltage rating. As an aid to eng
neers requiring the cutting and stri
ping of MIL wire, the brochure al
has a technical chart relating wi

In Arctic cold...

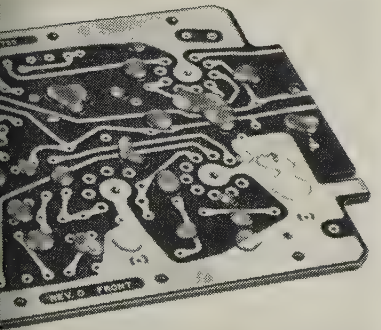


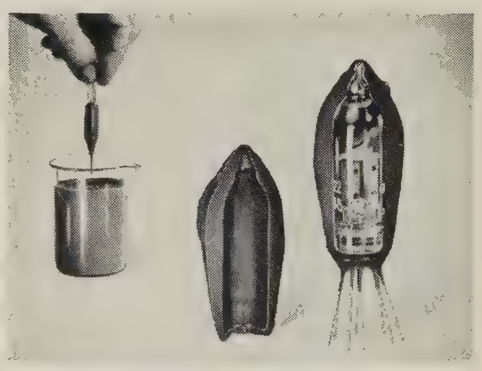
General Electric Silicone Fluids offer reliability from —65°F to 400°F as liquid dielectrics and heat transfer media in aircraft, missiles and ground installations. Excellent dielectric properties are virtually unchanged over wide ranges of temperature and frequency.

or missile heat...

G-E Silicone Rubber Insulation is used in missiles and space vehicles because of its excellent insulating properties, resistance to temperature extremes, moisture and ozone and its long-time stability in storage.

G-E silicone insulations do the job!





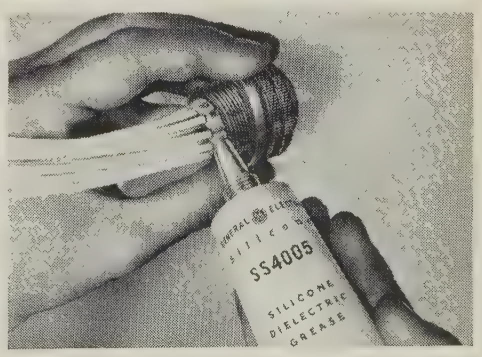
RTV* Liquid Silicone Rubber comes in a wide range of viscosities for potting, encapsulating, impregnating and sealing. RTV resists heat, cold, ozone, moisture; protects against high-altitude arc-over.
*Room Temperature Vulcanizing

G-E Silicone Varnishes provide excellent protection against moisture and high operating temperatures. Applications include conformal protective coatings for printed circuits, resistor coatings, transformer impregnation, etc. New varnishes cure at low temperatures.

New Silicone Dielectric Greases maintain physical and electrical properties from —65°F to 400°F, offer protection against moisture and oxidation. Used as corrosion inhibitors, lubricants, heat transfer media and release agents.

Silicone Rubber Wire Insulation withstands soldering heat without damage; matches or exceeds vital properties of insulation costing three times as much. Provides long service life at 500°F; momentarily withstands temperatures up to 5500°F. Flexible as low as —150°F, it resists moisture, ozone, nuclear radiation.

Send for technical data, "Silicones-for-Insulation." Section M1131, Silicone Products Department, Waterford, New York.



GENERAL ELECTRIC

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PT-425/RESIN • PT-425/RESIN • PT-425/RESIN • PT-425/RESIN

Is this for YOU?

PT-425/RESIN PROPERTIES:

Dielectric Strength: 2500 v/mil

Temperature Range: −65° to +300°F.

Weathering: Excellent

Salt Spray: More than 1000 hours

Hardness: 'H' Bake—'B' Air-dried

Excellent impact and abrasion resistance. Applied with conventional spray equipment—fast drying . . . no chalking . . . flexible. Excellent adherence to metals, wood, plastics.

PT-425/RESIN APPLICATIONS:

Exceptional circuit board dielectric coating and inexpensive. May be used in place of anodizing for aluminum. Could be used on aluminum wire with heat-accelerated drying.

Clear and transparent coverage is 400 sq. ft/gal/mil, and price is $6.54 per gallon, (gold or other pigmentation on request), FOB Los Angeles. Your order, please? Or write for more information

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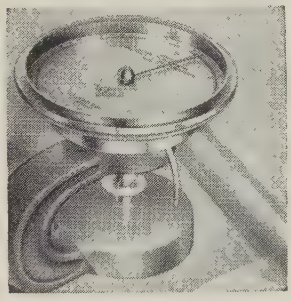
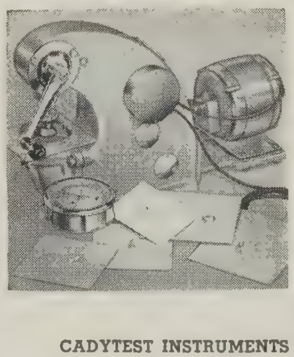
This Thickness Gauge Measures Strip or Sheet Stock In 10/1000ths of an Inch



Cady 10/1000 Micrometer Carbide Tipped Anvils Available

Portable and other models also available

Cady Automatic Burst Tester for Papers & Boards



CADYTEST INSTRUMENTS
Register Thickness, Burst Strength and Basis Weight.
Write for Brochure.

E. J. CADY & COMPANY
682 N. Harlem Avenue, River Forest, Illinois

Print Ins. 66 on Reader Service Card

footage and number of pieces per thousand feet for lengths from ⅛″ thru 12″ in 1/16″ increments. 4 pages. Alpha Wire Corp., 200 Varick St., New York 14.

Print No. Ins. 214 on Reader Service Card

Special-Purpose Coaxial Cable Listing

An extensive listing of non-R/G coaxial cable constructions designed to meet unusual requirements has the cables grouped in six temperature ranges from 80°C to 250°C, and impedance values from 35 to 190 ohms. Also given are construction details, general applications, and part numbers. 2 pages. Times Wire and Cable Div., The International Silver Co., Wallingford, Conn.

Print No. Ins. 215 on Reader Service Card

Catalog of Motor Slot Insulating Machines

New catalog covers a complete line of machines designed to insert insulation sleeves into the slots of stators and rotors. Each unit is illustrated. Technical description and data on method of operation, performance, delivery, and range of work handled are provided. A stator lacing machine is also included. 10 pages. Erinac Equipment Corp., 225 Lafayette St., New York 12.

Print No. Ins. 216 on Reader Service Card

Data Sheets on Wire Strippers

Data sheets describe, illustrate, and give machine specifications for a number of stripping machines for insulated wires. A price list of some complete machines and of parts is also included. 8 pages. The Wire Stripper Div., The Eraser Co. Inc., 1068 S. Clinton St., Syracuse 4, N.Y.

Print No. Ins. 217 on Reader Service Card

Bulletin Shows Plastics Users How To Reduce Handling Costs

A new bulletin describes ways plastics users can save costs and get better productivity by modernizing their methods for handling pelletized plastics. Bulletin No. 532 points out that "buying by the bag and then handling by hand adds to the cost, but not to the value of incoming materials." Examples of combination and suction-type Airstream conveyor systems and how they are used effectively in plastic processing plants a shown. Also described are actual i stallations. 6 pages. Dracco Di Fuller Co., Harvard Ave. and Ea 116th St., Cleveland 5, Ohio.

Print No. Ins. 218 on Reader Service Card

Brochure on Ultrasonic Tested "Teflon" Stock Shapes

New brochure explains how ultr sonic testing is used to provide sto shapes of Teflon with internal quali and uniformity. 4 pages. The Polym Corp. of Penna., 2140 Fairmont Av Reading, Pa.

Print No. Ins. 219 on Reader Service Card

Catalog of Drafting Pencils

A comprehensive new catal shows and describes 81 items d signed to make it easier for enginee and draftsmen to execute drawin with good reproducing qualitie Among them are new pencils special designed for work on drafting fil pencils designed for color coding tracings, non-reproducing pencils f making temporary work notes drawings, as well as a comprehensi selection of other drafting penci leads, and holders. 24 pages. J. Staedtler Inc., Hackensack, N.J.

Print No. Ins. 220 on Reader Service Card

Catalog on Electric Melting Pots

A new catalog (VG-201-P) on ele tric melting pots for solder, lea glues, and compounds contains c tailed specifications and prices on complete line. 8 pages. Vulcan Ele tric Co., Danvers, Mass.

Print No. Ins. 221 on Reader Service Card

Bulletins on Armature Winder; Cell, Wedge, and Cuff Inserters

Three new bulletins describe a list specifications for an automat armature winder (No. 605-AL, pages), automatic cell and wedge i serters (No. 598CW, 4 pages), a an automatic stator cuff inserter (N 603-SC, 2 pages). A data sheet is al available which describes a semiau matic machine for taping bundles wires with pressure-sensitive tapes. page. Possis Machine Corp., 8 Rhode Island Ave. So., Minneapo 26, Minn.

Print No. Ins. 222 on Reader Service Card

‘Universal’’ Circuit Cards For Many Functions

A “universal” circuit card report-dly can be prefabricated and adapted o different circuit requirements for omputers and other uses. The stock ard developed by Librascope Div., eneral Precision Inc., contains a niversal etched pattern which can be nodified by interconnections to form esired circuit functions.

Components may be added to form ogic modules before the final design f the computer is ready, and then. hen the design is firmed, these nodules may be interconnected to orm the required circuits.

A good example of the use of this echnique is in the prefabrication of he four huge data processing central omputers Librascope recently com-leted for the Federal Aviation gency’s air traffic control program. ach computer card is capable of aking 33 individual modules, and nterconnection was made after the nal computer design had been rmed.

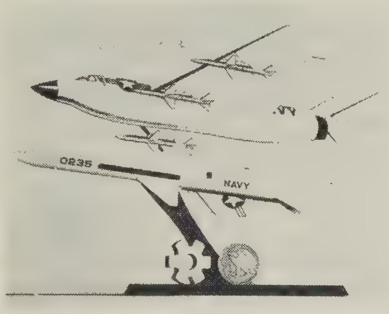
The technique was developed to peed production of extremely short un equipment, and does not result in he most compact packaging, or in a ard that is particularly adaptable to nass production. But where a single nit, or less than five machines are eing built, savings in production ime and reduction in the lag between esign and assembly make this tech-ique highly desirable.

Another innovation in the card is hat the etched circuitry is carried hrough from the base plug of each ard to the top of the card where a uplicate connector is provided. This permits the card to be connected to a test instrument while it is plugged into the computer.

In order to facilitate checking, circuitry used in a computer such as an FAA data processing central restores signals at each gating point throughout the machine to eliminate signal degeneration. Since all connections are available at the top of the cards, an auxiliary maintenance panel can be plugged in and troubles can be diagnosed without the necessity for circuit crawling with an oscilloscope. This materially reduces testing and checkout time during final inspection.

Tiny Magnet Guides Missile

A tiny permanent magnet, no bigger than a half dollar, is helping to guide the Sparrow III air-to-air missile to its target by supplying the power output used in the guidance system of the missile. The magnet is made of Alnico V material by The Arnold Engineering Co. of Marengo, Ill.

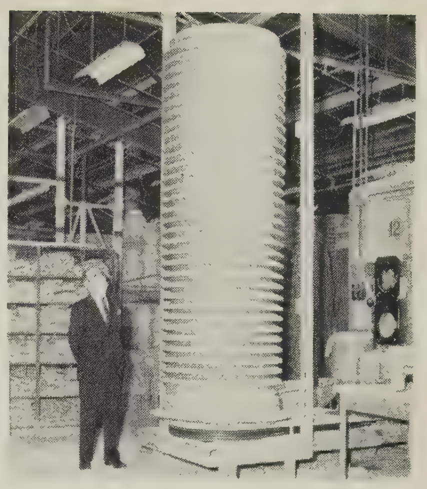


Attached to the rotor of the turbine-powered synchronous generator, the small magnet can generate up to 35 watts of power for the missile’s guidance system. In spite of the high degree of sophistication, the reliability of the missile has been excellent.

Gargantua of High Voltage Porcelains

The special porcelain shown in the illustration was designed for use in high voltage equipment rated at 345 kv and is thought to be the largest single-piece porcelain ever made.

In the “green” clay state, as it appears in this photograph, the bushing is over 112″ long, more than 3′ in diameter, and weighs approximately 3200 lbs. After the piece has been dried, it will be glazed, internally and externally, and fired in a special kiln designed for large pieces of this type. A major production problem revolves about the handling of this porcelain before firing. At this stage it is simply dry clay and quite fragile. Elaborate techniques have been developed for handling such pieces in the factory of the manufacturer, Lapp Insulator Co. Inc.



After firing, the porcelain will be ground flat and parallel to a ±1/32″ tolerance on the overall length, for gasketing against internal pressure. The porcelain will be tested to 308 psi internal hydraulic pressure. The fog type design provides 245″ of leakage distance.

Interlab Test Data Compared

A method for evaluating mathematically the factors involved in the variability of interlaboratory test results has been developed by J. Mandel and T. W. Lashof of the National Bureau of Standards. This “model” for statistical analysis has been successfully applied to several problems involving both physical and chemical properties of materials. A better appraisal of test methods can be made by utilizing the method to distinguish between random and systematic sources of error.

While the model is designed primarily for the study of a single test method on an interlaboratory scale, it can also be used for the interlaboratory comparison of two alternative test methods.

New Publications

Books

Radiations and Matter, by André Berthelot (English translation by F. R. Paulsen). Suited for acquiring a basic knowledge of matter, this book deals with some general introductory aspects of the subject, the properties of particulate 'radiations' and photons, and considers the interaction of radiations with matter, especially with regard to the loss of energy in material media. It is based on lectures given at the Faculty of Sciences at Paris. 180 pages, $3.50. The Macmillan Co., 60 Fifth Ave., New York 11.

Theoretical Elasticity and Plasticity for Engineers, by D. E. R. Godfrey. Provides an introductory account of the theory of elasticity and plasticity and may be used to follow-up the usual strength-of-materials approach adopted by engineers. It is suitable for personal study and has problems provided at the end of most chapters together with worked solutions. 311 pages, 154 diagrams and charts, $9. The Macmillan Co., 60 Fifth Ave., New York 11.

Technical Communication, by George Harwell. Designed to meet the needs of engineers, scientists, and businessmen, this book shows how to put technical information across clearly and efficiently. Chapters cover effective writing, organization of material, methods of exposition, business letters, general reports, formal reports, informal reports, technical articles, oral communication, illustrative material, and general composition. An appendix of ASA abbreviations for scientific and engineering terms is included as are examples of all topics discussed. 332 pages, $5. The Macmillan Co., 60 Fifth Ave., New York 11.

Ultrasonics, by Benson Carlin. Revised second edition covers theory and methods of generating waves, outlines circuits and other considerations, and discusses mechanical and electrical design of systems. 350 pages, 6″ x 9″, 263 illustrations, $11.50. McGraw-Hill Book Co., 330 West 42nd St., New York 36.

Analog Computation in Engineering Design, by A. E. Rogers and T. W. Connelly. Covering practical techniques for using analog computers to solve problems in engineering design, this book stresses methods of problem preparation, shows how to effectively use computers, and gives illustrative examples of computer techniques used to solve technical problems in such areas as chemical processes and process controls, feed-back control systems, nuclear reactors, and problems involving statistical phenomena. 450 pages, 6″ x 9″, 275 illustrations, $16. McGraw-Hill Book Co., 330 West 42nd St., New York 36.

National Electrical Code Handbook. Revised tenth edition (1960). 679 pages, 5⅜″ x 8″, 387 illustrations, 53 tables, $8.50. McGraw-Hill Book Co., 330 West 42nd St., New York 36.

Electrical Noise, by W. R. Bennett. How noise originates in electrical circuits, the terms in which it is described, how it is measured, and how circuits may be designed to minimize undesirable effects from noise are covered. 288 pages, 6″ x 9″, 106 illustrations, $10. McGraw-Hill Book Co., 330 W. 42nd St., New York 36.

Boron—Synthesis, Structure, and Properties. Consists of the 21 technical papers presented at the September 1959 conference on boron sponsored by the Institute for Exploratory Research, U.S. Army Signal Research and Development Laboratory. Illustrated, 208 pages, $8.50. Plenum Press Inc., 227 W. 17th St., New York 11.

STP 269, Symposium on Spectroscopy. This symposium concerned with "unsolved problems" includes representative papers in emission, X-ray, flame photometry, ultraviolet absorption, magnetic resonance, and infrared spectroscopy. In addition to treatment of many sophisticated approaches to analytical problems, the book contains a report on Soviet
progress in the field of molecul
spectroscopy. Hard cover, 246 page
6″ x 9″, $7. American Society f
Testing Materials, 1916 Race S
Philadelphia 3, Pa.

Practical Electrical Wiring,
H. P. Richter. Revised sixth editi
of this manual conforms with t
1959 edition of the National Ele
trical Code. The book is planned
enable the reader to learn electri
wiring in a practical fashion. 5
pages, 463 illustrations, 5⅜″ x 8
$7.95. McGraw-Hill Book Co., 330
42nd St., New York 36.

Standards

MIL-E-22200(SHIPS), Electrod
Welding, Covered; General Specif
tion. This specification includes ge
eral requirements, quality assura
provisions, test procedures, and i
structions for preparation for delive
of covered welding electrodes. Bure
of Ships, Washington 25, D.C.

The following five new and revis
publications have just been issued a
are available from the National El
trical Manufacturers Association, 1
E. 44th St., New York 17.

CN 1-1960, Room Air Condition
A cooling load estimate form
been added. Definitions, rating sta
ards, and test procedures are cover
30 cents.

EI 2-1960, Instrument Transfor
ers. Type VIII metering curr
transformers have been added a
changes have been made in the dim
sions of Type I and V metering c
rent transformers. EI 2-1960 a
covers indoor potential transforme
metering current transformers
primary circuits, and instructions
the card and operation of instrum
transformers. 50 cents.

SH 3-1960, EEI-NEMA Standa
for Voltage Classification of Lu
naires Used in Street and Highw
Lighting. Also covers dielectric te
ing. 25 cents.

TR 1-1960, Transformers, Regu
tors, and Reactors. Revised publi
tion is divided into 20 parts and

cludes general standards, test code, terminology, and apparatus standards. It refers to other ASA and NEMA publications for these products which, when combined with TR 1-1960, will complete the NEMA Standards Publication and will result in a single comprehensive publication for transformers, regulators, and reactors. $1.

WC 4-1960, American Standard Requirements for Varnished Cloth Insulated Cables. Information is given for conductors, insulation, shielding, assembly of core, outer coverings, testing, shipping, and installations relating to all sizes and classes of underground, aerial, and indoor power cables which are insulated with varnished cloth. $2.

IEC Publication 121—Recommendation for Commercial Annealed Aluminum Electrical Conductor Wire. Covers physical and mechanical property values of wire having a diameter greater than 1 mm (0.0394″). 80 cents. American Standards Assn., Dept. PR180, 10 E. 40th St., New York 16.

Standardization Activities in the United States—A Descriptive Directory, by Sherman F. Booth. 210 pages, $1.75. Order National Bureau of Standards Miscellaneous Publication 230 from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

ASESA Information

The following bulletins merely provide information about action taken by the Armed Services Electro-Standards Agency, Fort Monmouth, N. J. Printed copies of the actions are not yet available.

MIL-R-12934B, Resistors, Variable, Wirewound, Precision. Supersedes MIL-R-12934A(SigC) dated 19 April 1956, and MIL-R-19518(SHIPS), dated 31 August 1956, with several changes.

MIL-R-29A, Resistors, Fixed, Meter Multiplier, External (High Voltage, Ferrule Terminal Type). Supersedes JAN-R-29 with several changes and additions.

MIL-R-11/8A, Resistors, Fixed, Composition (Insulated). Supersedes MIL-R-11/8 and lowers the minimum resistance value to 10 ohms.

MIL-S-3928A, Switches (Coaxial), Radio Frequency Transmission Line. Supersedes MIL-S-3928 with several changes.

Clarification of Duration of Qualification Approval. Despite changes in specifications, products will remain on the Qualified Products List (QPL) until the manufacturer is notified that retesting is necessary. In addition, the manufacturer will be notified of removal.

MS35179D, Connectors, Coaxial, Radio Frequency and Associated Fittings, Series BNC Connector Type UG-1094A/U. Contains several changes enabling the connector to be mounted on a ¼-inch panel.

MS90178, Standard 24-Value Series Decade for Electronic Components of 5-, 10-, 20-Percent Tolerances. Revision B incorporates a 24-value series decade.

MIL-M-10304B, Meters, Electrical-Indicating Panel Type, Ruggedized, General Specification for. Revision B supersedes MIL-M-10304A, dated 27 September 1955, with several significant changes.

MIL-I-10A, Insulating Materials, Electrical, Ceramic, Class L. Amendment 1 clarifies specification and qualification requirements regarding glazed and unglazed body materials. The length of the flexural strength specimen is 5″ between supports, 6″ overall.

MIL-L-3661A, Lampholders; Lights, Indicator; Indicator-Light Housings; and Lenses, Indicator Light. Revision A reflects several changes in format and requirements.

MIL-R-22A, Resistors, Variable (Wirewound, Power Type). Amendment 2 substitutes 5% for 1% in the second and third sentence of paragraph 3.10, Vibration.

MIL-B-5423B, Boots, Dust and Water Seal (For Toggle and Push-Button Switches and Rotary-Actuated Parts). A new specification, it supersedes MIL-B-005423(ASG), dated 26 April 1956, and MIL-B-19257 (SHIPS), dated 11 June 1956. Supplement-1 lists applicable detail specifications for individual boot types and styles.

MIL-V-173B, Varnish, Moisture-and-Fungus-Resistant (For the Treatment of Communications, Electronic, and Associated Electrical Equipment). Revision B supersedes MIL-V-173A and Amendment 4 with several changes, including deletion of the qualification requirements.

Government Publications

Test Methods for Electronic and Electrical Component Parts. Military standard establishes uniform methods for testing electronic and electrical component parts, including basic environmental tests to determine resistance to deleterious effects of natural elements and conditions surrounding military operations. Illustrated, 104 pages, 65 cents. Order Catalog No. D 7.10:202B from the Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C.

OTS Reports

The following reports may be ordered by number from the Office of Technical Services, Dept. of Commerce, Washington 25, D. C.

PB 161715, Bureau of Ships Shop Practice Suggestions. An improved method of bending plastic pipe, requiring less than a tenth of the time it normally takes, is one of 70 techniques and devices recommended in the first issue of a series of collections of time and money-saving suggestions obtained from Navy activities. 24 pages, 50 cents.

SB-405, Reliability and Quality Control (1950-1960), selective bibliography. 10 cents.

SB-406, Adhesives (Supplement to CTR-300), selective bibliography. 10 cents.

SB-407, Linear Programming (1950-1960), selective bibliography. 10 cents.

Looking for high temperature resistance? Stop in and hear Chester Haskfortheorder present data on the fabulous new ISOESTERENE materials at the Insulation Conference Marketing Meeting in Chicago, Dec. 8.

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Dates to Circle

Meeting and Convention Notices

Oct. 31-Nov. 2 . . . IRE, Radio Fall Meeting, Hotel Syracuse, Syracuse, N.Y.

Oct. 31-Nov. 4 . . . IEC, General Meeting, New Delhi, India.

Nov. 1-4 . . . ASTM Committee D-27 on Electrical Insulating Liquids and Gases, Williamsburg Motor House, Williamsburg, Va.

Nov. 7 . . . AIEE, 2nd Western Appliance Technical Conference, Los Angeles Section, Biltmore Hotel, Los Angeles.

Nov. 7 . . . SPE, Retec on "Automation in Injection and Compression Molding," Ontario Section, King Edward Sheraton Hotel, Toronto, Ontario, Canada.

Nov. 14-17 . . . The Wire Assn., Annual Convention, La Salle Hotel, Chicago.

Nov. 14-17 . . . AIEE, Magnetism and Magnetic Materials Conference, Hotel New Yorker, New York City.

Nov. 15-16 . . . IRE, Mid-America Electronics Convention, Hotel Muehlebach, Kansas City, Mo.

Nov. 15-17 . . . IRE, Northeast Electronics Research and Engineering Meeting, Boston, Mass.

Nov. 18 . . . SPE, Retec on "Blow Molding Comes of Age," Newark Section, Essex House, Newark, N.J.

Nov. 27-Dec. 2 . . . American Society of Mechanical Engineers, Annual Meeting, Statler-Hilton Hotel, New York City.

Nov. 28-30 . . . American Society of Refrigerating Engineers, Semiannual Meeting, Chase-Park Plaza Hotel, St. Louis, Mo.

Nov. 30-Dec. 2 . . . Ninth Annual Symposium on Technical Progress in Communication Wires and Cables, sponsored by The U. S. Army Signal Research and Development Laboratory, Berkeley-Carteret Hotel, Asbury Park, N.J.

Dec. 5-7 . . . EIA, Third Conference on Maintainability of Electronic Equipment, Hilton Hotel, San Antonio, Texas.

Dec. 5-8 . . . Third National Conference on the Application of Electrical Insulation, Conrad Hilton Hotel, Chicago.

Dec. 13-15 . . . Eastern Joint Computer Conference, sponsored by IRE, AIEE, and Assoc. for Computing Machinery, New Yorker Hotel and Manhattan Center, New York City.

Jan. 9-11 . . . AIEE-IRE-ASQC, 7th National Symposium on Reliability and Quality Control, Bellevue-Stratford Hotel, Philadelphia.

Jan. 16-18 . . . American Astronautical Society, 7th Annual Meeting, Sheraton-Dallas Hotel, Dallas, Texas.

Jan. 16-20 . . . Western Winter Radio-Television & Appliance Market (Division of Western Home Goods Market), Western Merchandise Mart, San Francisco, Cal.

Jan. 23-27 . . . Gaillard Seminar on Industrial Standardization, Engineering Societies Building, New York City.

Jan. 24-27 . . . SPE, 17th Annual Technical Conference, Shoreham and Park-Sheraton Hotels, Washington, D.C.

Jan. 29-Feb. 3 . . . AIEE, Winter General Meeting, Hotel Statler, New York City.

Jan. 30-Feb. 3 . . . ASTM, Committee Week, Netherland-Hilton Hotel, Cincinnati.

Feb. 1-3 . . . 2nd Winter Military Electronics Convention, sponsored by the National Professional Group on Military Electronics and the Los Angeles Section of IRE, Biltmore Hotel, Los Angeles.

Feb. 5-11 . . . National Electrical Week.

Feb. 7-9 . . . SPI, 16th Reinforced Plastics Division Conference, Edgewater Beach Hotel, Chicago.

Feb. 15-17 . . . AIEE, IRE, and the University of Pennsylvania, International Solid-State Circuits Conference, University of Pennsylvania and the Sheraton Hotel, Philadelphia, Pa.

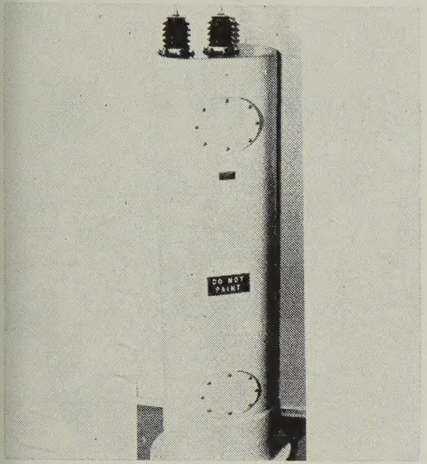
Feb. 26-Mar. 1 . . . First Annual Pacific Electronic Trade Show, Great Western Exhibit Center, Los Angeles.

Abbreviations Used in Notices

AIEE	—American Institute of Electrical Engineers
ASTM	—American Society for Testing Materials
ASME	—American Society of Mechanical Engineers
ASA	—American Standards Assn.
IRE	—Institute of Radio Engineers
EIA	—Electronic Industries Assn.
NEMA	—National Electrical Manufacturers Assn.
NISA	—National Industrial Service Assn.
SPE	—Society of Plastics Engineers
SPI	—Society of the Plastics Industry
WEMA	—Western Electronic Manufacturers Assn.

Polyester Antenna Trunk For Maritime Use

Sturdy, streamlined, elliptical-shaped, fiber glass-reinforced plastic (FRP) antenna trunk approved for maritime use is shown here as used with a conventional ship antenna installation. Emergency antenna normally connects with insulator at left; main antenna connects to center insulator. A 40-foot, self-supported vertical whip antenna can be inserted in top of trunk in place of center insulator.

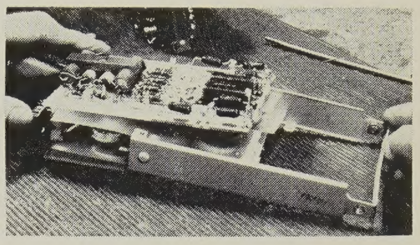


Distinguished by its light weight, functional efficiency, attractive appearance, and freedom from painting and maintenance, the glass-reinforced polyester antenna trunk is fabricated from "Hetron" 92, fire-retardant, corrosion-resistant resin produced by the Durez Plastics Div., Hooker Chemical Corp., North Tonawanda, N. Y.

Design and construction of the unit are a direct result of a joint development project conducted by Texaco Experiment Inc., Richmond, Va., a subsidiary of Texaco Inc., N.Y.; Mobjack Manufacturing Co., Gloucester, Va.; and the Marine Div., Mackay Radio and Telegraph Co. Inc., Clark N. J.

Elastomer Prevents Potting Leakage

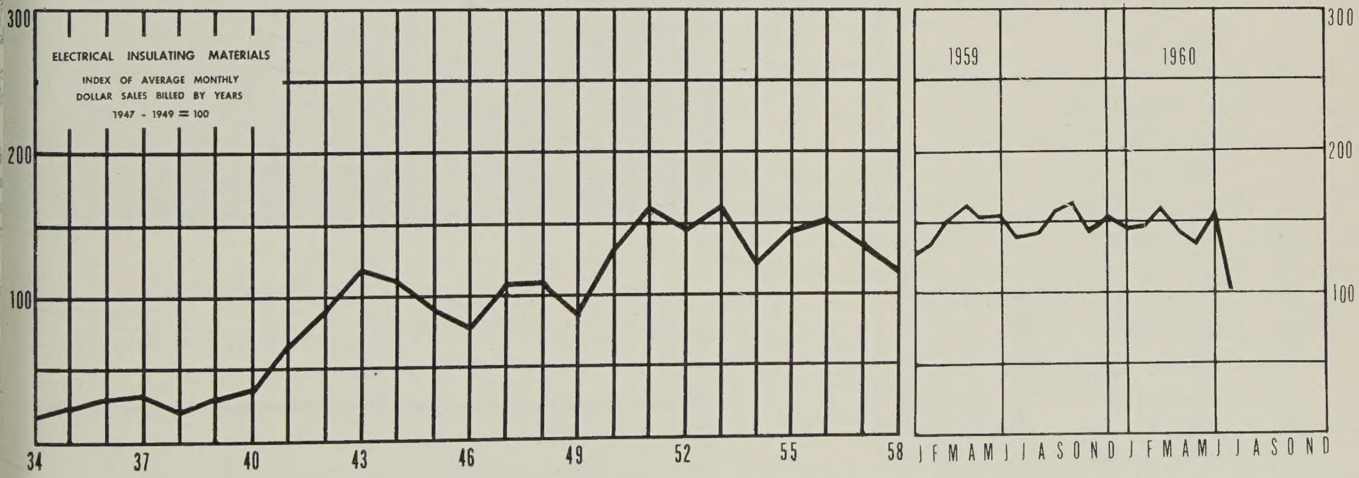
In potted equipment, such as this plug-in subassembly used in a high-speed digital computation system, the liquid epoxy potting resin often leaked through the connector, fouling pins. This problem has been solved at the Industrial Engineering Dept., Librascope Div., General Precision Inc., Glendale, Cal., by pre-potting the terminal side of the connectors with a foamed elastomer before the unit is assembled.



The "pad of foamed elastomer serves a dual function. It prevents leakage of the epoxy resin, and provides a non-rigid installation for the connector terminals to prevent shorts or arc-over.

Attempted payola! Watch Haadknose Byer's reaction to unethical sales practices at the Insulation Conference Marketing Meeting in Chicago, Dec. 8.

NEMA Electrical Insulation Index



	July '60	June '60	July '59
Index Series	101	152	131
July '60 point change from other mos.		—51	—30
July '60 % change from other months		—34	—23

Index is based on 1947-1949 average month, inclusive=100

Published through the courtesy of the National Electrical Manufacturers Association

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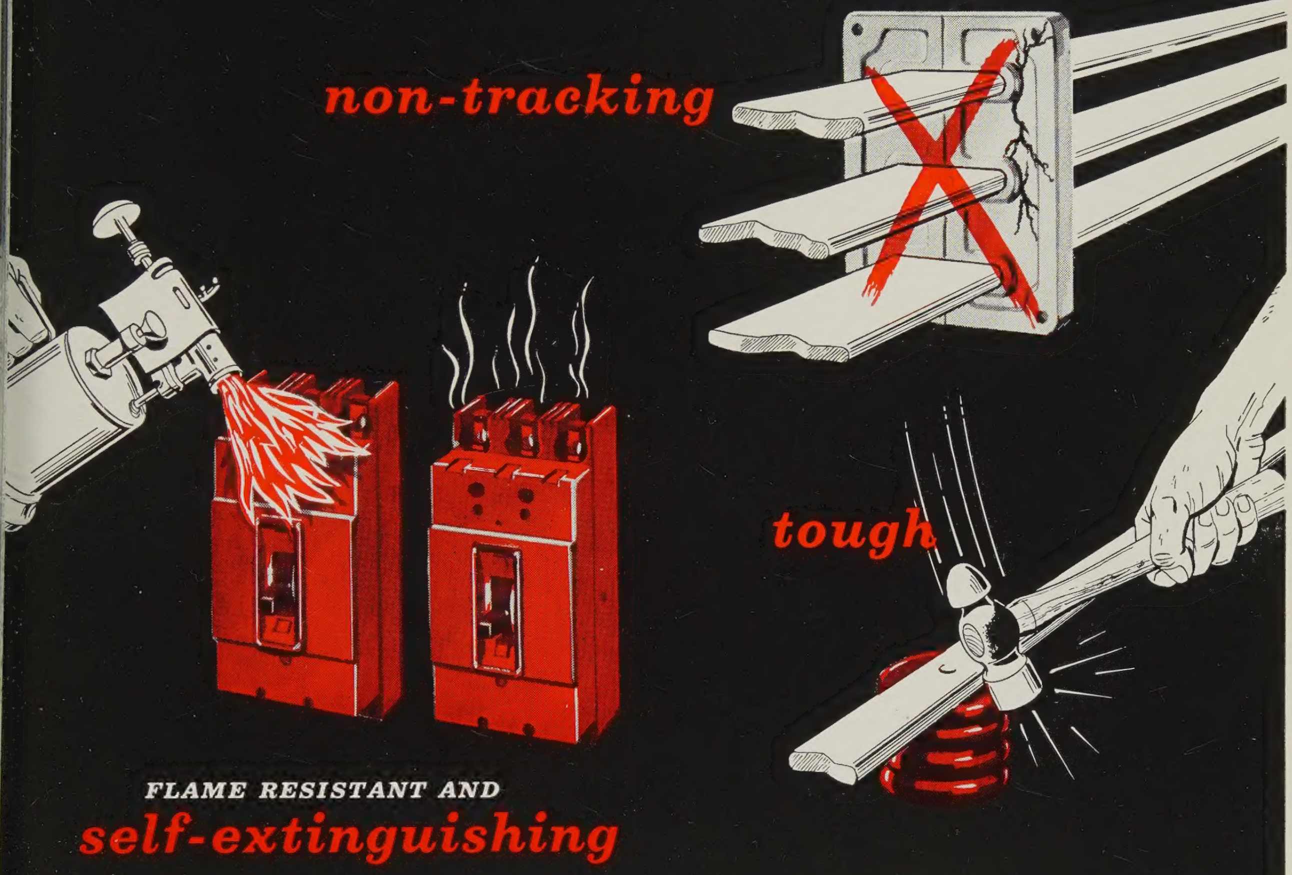

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